

POSTER COMMUNICATIONS

ATHLETE'S CARE-I

Medical examination in the detection of cardiovascular risk factors in athletic children and adolescents

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Introduction: The early detection of personal (PCVRF) and family (FCVRF) cardiovascular risk factors during childhood, remain a priority in Preventive Cardiology and Paediatrics, as well as in Sport Medicine. We analyzed the efficacy of a complete medical examination in this population, through medical records obtained from two different Spanish Sports Medical Centres with experience in this area.

Methods: We present a retrospective study, employing medical files from 547 children and adolescents evaluated in the IDM (Public Sport's School) of Santoña, (Cantabria) between 2005-2007 and other 107 from CEDENA (Sports Medical Centre for Athletic Children) in Almería (Andalusia) between 2005-2008. We took particular interest on PCVRF and FCVRF and also cardiovascular sudden death (CSD); besides, food habits, toxic ingestion, time spent in physical or sedentary activities, physical exploration; systolic and diastolic blood pressure; electrocardiogram at rest. We evaluated excess of weight, obesity and hypertension. We present the PCVRF and FCVRF in absolute value or groups if they are \leq to 2 or \geq a 3 CVRF with special interest in CSD events in the family.

Results: Mean age were 9, 6 (\pm 3, 3) and 12,3 (\pm 3) years for the Cantabria and Almería groups respectively. In the IDM group, we detected 235 PCVRF (209 had only one factor and at least 2 in the remaining 26). From them, 122 were excess of weight or obesity, 96 heart murmurs (7 congenital heart diseases), hypercholesterolemia in 5, hypertension in 4, frequents ventricular ectopy in 3, diabetes in 2, 1 WPW and 1 long QTc syndrome. These PCVRF were associated with 389 FCVRF over a total of 873 detected (669 had two factors, 186 \geq 3 and 18 were CSD). In the Cedena Group we registered 43 PCVRF (42 had \leq 2 factors and only in one 3 factors). From them: 30 were excess of weight or obesity, 25 heart murmurs (5 with congenital heart disease); hypertension in 16, hypercholesterolemia in 6, diabetes in 2, 1 WPW and long QTc syndrome. These PCVRF were associated with 26 FCVRF over a total of 66 detected (44 had two factors, 3 or more in 22, included 6 CSD cases).

The majority of the children from Santoña: 474 and 87 from Almería performed a single sport activity; 67 from the IDM and 14 from the CEDENA carried out 2 sport activities and another six in each group: 3. Throughout the questionnaires, we detected high levels of saturated oil intake in 31 children from Cantabria and 13 from Andalusia.

Conclusion: The search for personal and family risk factors together with a complete physical examination should be used in the sports care system, when applied to children. The use of a complete sport medical record highlights the elevated prevalence of PCVRF and FCVRF. The early detection of risk factors is necessary for its adequate prevention and correct treatment.

Key words: Detection of cardiovascular risk. Athletic children. Adolescents.

Adequacy of the progressive effort test in field for population with intellectual disability

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Introduction: The purpose of the study is to define the multistage run test in field more convenient to measure and evaluate the aerobic capacity in population with Intellectual Disability (ID).

Material and methods: Course Navette and PACER with musical support were administered, with a difference week and in a controlled scene, to three groups of population: 8 individuals with Down Syndrome (DS), 13 individuals with Intellectual Disability non Down Syndrome (ID-non-DS) and 9 individuals without Intellectual Disability (noID) acting as control group. The average age of the sample was 29 \pm 7,3 years, and the individuals with ID present a mild or moderate level of disability. An initial familiarization session was performed before the study, and the informed consent was obtained.

Results: The ID-non-DS and no ID, both present better absolute values in Course Navette (ID-non-DS=1,0-8,5min; noID=5,0-13,0 min) than in PACER (ID-non-DS=0,5-7,5 min; noID=5,0-12,0 min), and the mean of the results were ID-non-DS= 3,6 \pm 2,7min vs 3,6 \pm 2,3 min; noID=8,7 \pm 2,3 min vs 8,3 \pm 2,2 min. The values obtained in both tests by the population with DS are lower than the obtained ones for the other two groups: Course Navette=1,0-3,0 min; mean=1,8 \pm 0,7 min and PACER =0,5-5,5 min; mean=2,3 \pm 1,7 min.

Conclusions: 1) The groups noID, both obtained better performance in Course Navette, therefore this test will be indicated. 2) The DS group has better results with PACER, being this test indicated for this population. 3) Does exist a difference between Course Navette and PACER results among the DS and ID-non-DS groups, therefore is recommended to do the measurements and evaluations separately. 4) Would be advisable to increase the sample to study the significance of the obtained differences.

Key words: Intellectual Disability. Multistage run test. Indirect tests.

Effects of vibrotherapy on electric activity of fatigued muscles in professional basketball women players

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Introduction: Throughout recent years different mechanical devices have been designed in order to help sport players' recovery. The scope of this study was assess the efficiency of a mechanical device that generates vibrations (vibrotherapy) in lower extremities, on fatigued muscle in professional basketball players.

Material and methods: Subjects: 12 professional basketball women players (22,5 \pm 5,0 years old, 79,5 \pm 7,8 kgs., 177,5 \pm 7,0 cms.).

Material: MRM[®] vibrotherapy device was used. It generates rhythmic moves in lower extremities at a frequency of 3,4 Hertz during 6 minutes. Also, a surface electromyograph MEGA[®] (Muscle Tester ME 3000, 8 channels, software Megawin[®] 2.1 version).

Method: patient is sat down with knee bent up to 45°, and is asked to do a maximum isometric contraction of right leg (10 seconds) both pre and post vibrotherapy application during 6 minutes. Afterwards the electrical activity of vastus medialis and biceps femoris was analysed through surface electromyography, during maximum isometric contraction pre and post vibrotherapy application.

Statistical Analysis: it was made through the Wilcoxon test.

Results: Electric activity of treated muscles increases after vibrotherapy application (p<0,05).

Conclusions: Vibrotherapy with MRM[®] device at a frequency of 3,4 Hertz, increases the electric activity of treated muscles in professional basketball women players.

Key words: Vibration. Basketball. Surface electromyography.

BIOMECHANICS-I

Image acquisition and movement analysis – a protocol aiming to decrease trauma incidence in high level volleyball

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Introduction: The purpose of the research is focused on decreasing the trauma risk by introducing trauma prevention strategies within the sport training process, aiming in the same time to optimise the evaluation of proposed methods by using new non-invasive strategies as image acquisition and movement analysis and to lead to the improvement of sport performance.

Methods: The experimental research was carried on a group of 12 senior women volleyball players, components of the volleyball team of the University of Craiova Club, during July 2006- June 2007. We conceived a programme of kinetic exercises addressed to rotator cuff tendinitis and patellar tendinitis. The proposed model applied for a period of one year macrocycle. Determination of joint amplitude angles in internal and external rotation for scapulohumeral joint, both for dominant and non-dominant upper limb, calculation of forces indicators for scapular and palm muscles; dynamic measurements of specific cinematic parameters in the strike attack in volleyball by using the acquisition and movement analysis system 3D "Simi Motion" and dynamic measurements of specific cinematic parameters by using the scanning and equilibrium system "RSSCAN and force platform Kistler "AMTI" were carried on before and after application of the proposed programme.

Results: Application of the preventional programme addressed to rotator cuff tendinitis led to an improvement of scapular and palm force index, final testing showing a progress of 11% and respectively of 16% comparing to initial testing and to an improvement of the amplitude of joint movement of 17% for internal rotation in the dominant limb (scapulohumeral joint). Average values for the muscular forces of the muscular groups targeted by the programme raised with a value between 10% and 23%. The most significant increases were recorded for the supraspinatus muscle, with a percentage of 18,84%, and the lowest for teres minor with a percentage of 8,23%.

Applications of the preventional programme addressed to patellar tendinitis, led to increases of medium forces of the main muscles involved in jumping during the strike attack, with a percentage between 11% and 25%, in the same time with decreases of the compression forces into the knee joint. For the lower limb the most significant increase was recorded for the biceps femoralis muscle, with a percentage of 15,94%, and the lowest for solearius muscle with a percentage of 13,87%.

Conclusions: The main goal of the present study was to establish a correlation between biomechanical characteristics and trauma incidence. Improvement of proposed parameters demonstrate the practical efficiency of the prophylactical programme by equilibration of the muscular and joint im-balance. By exploitation and comprehension of the aspects involved in the dynamic of the volleyball game, different prophylactical and rehabilitational programmes can be further developed.

Key words: Trauma prophylaxis. Image acquisition. Movement analysis.

Elaboration of a tridimensional musculoskeletal model based on strike attack biomechanical analysis in volleyball

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Introduction: Over the last decade, significant advances have been made in the study and understanding of movement mechanics. Much of this may be attributed to the use of more sophisticated technology to improve our ability to assess the human body in real-time athletics. As a consequence of these advances, our understanding of the pathophysiology of injury has also increased. New insight into playing forces during complex actions as the

throwing motion allowed us to develop better protocols for the prevention and treatment of the most common injuries. In the present paper we used motion analyses with a specific aim: analyzing the technique in the attack strike in volleyball for the upper limb and obtaining motion-specific parameters for this specific movement, with special consideration on the overhead throwing, lead to elaboration of a biomechanical model. Using of the proposed model for identification of the mechanisms that predispose to injury in terms of biomechanics can lead to improvement of technique and decrease of injuries. In this way the methodology of training must be continuously developed, considering the achievements of modern physiology and biomechanics of sport activity.

Methods: The experimental research was carried on a group of 12 senior women volleyball players, components of the volleyball team of the University of Craiova Club, during July 2006- June 2007. The measurements were focused on goniometry (evaluation of movements for the glenohumeral joint); dynamometry (force indexes for shoulder and palm); cinematics measurements (joint angles) and kinetic measurements (muscular forces). Data were recorded by using the movement analysis system 3D "Simi Motion", the scanning and equilibrium system "RSSCAN and force platform Kistler "AMTI". Interpretation and synthesis of data were performed by using the Footscan Scientific and Anybody software.

Results: The data initially obtained by SIMI, RSSCAN and AMTI were used as input data for the Anybody system. In the present study the "Anybody" software permitted the evaluation of the shoulder and knee muscular forces during the strike attack in volleyball, based on the feed-back dynamics (knowing the limb trajectories we can identify the muscular forces) and direct comparison of the obtained values in the initial and final testing. Due to this software we calculated the muscular forces, reactional and joint moments, reconstructing the movement for the implemented models by using the markers coordinates and the values of the contact pressure and forces for the weight center and obtaining an computerized model of the strike attack in volleyball with individualisation possibilities for each player.

Conclusions: The new modalities in approaching the biomechanical analysis in high level sports by complex computerised techniques, offer the possibility for analysing the cinematic and dynamic properties of movements and to elaborate scientific models that simulate and realise predictions in a various range of movements. Elaboration of the original tridimensional musculoskeletal model permitted behavioural simulation for the lower and upper limb during the strike attack in volleyball and data collection regarding biomechanical conditions that encourage trauma production in volleyball players.

Key words: Movement analysis. Biomechanical model. Behavioural simulation.

Difference of trunk musculature activity during driver swing in novice, amateur and professional golfers

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Introduction: The purpose of this study is to analyze a difference of trunk muscle activity throughout phases of the driver swing in novice, amateur, and professional golfers.

Methods: Using surface electrode electromyography, we evaluated the muscle activity as a value of root mean square during the driver swing in 3 groups composed of 15 male golfers. Surface electrodes were used to record the muscle activity on bilateral *Rectus Abdominis*, *Obliquus Abdominis*, and *Erector Spinae* during the swing.

Results: There were no significant differences among 3 groups in left *Rectus Abdominis*, *Obliquus Abdominis*, and *Erector Spinae*. In amateur and professional golfers, right *Obliquus Abdominis* and *Erector Spinae* muscle activity increase from downswing to impact phase and decrease after impact phase. But, in novice golfers, right *Obliquus Abdominis* and *Erector Spinae* muscle activity gradually increase throughout entire phases.

Conclusion: These findings suggest that well-trained golfers may use right *Obliquus Abdominis* and *Erector Spinae* effectively during golf swing.

Key words: Golf swing. Electromyography. Trunk muscle.

The type of contact mat affects vertical jump height estimated from flight time

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Introduction: Measuring flight time (Ft) on a contact mat is a common methodology to estimate vertical jump height during field tests. It is more objective, valid and reliable than "Jump and Reach Tests" and "Belt Tests". In the last decade, rubber contact mats (mechanics) have been replaced by laser and infrared ones (optoelectronics). The aims of this study were: a- to analyze the influence of the contact mat technology on Ft, and b- to verify the validity and reliability of a new contact mat.

Methods: Eighty-nine physical students performed 3 maximal jumps which were simultaneously registered by one force plate (FP) and two optoelectronics contact mats: SportJump System Pro (SJ) and ErgoJump Plus (EJ). The jumps were performed in a randomized order in the directions longitudinal and transversal with respect to FP. Data are presented as Mean±SD, coefficient of variation (CV) and 95% confidence limits (CL). * $p < 0.001$.

Results: SJ underestimated Ft (10.6 ms, CL= 10.4-10.9 ms) while EJ overestimated it (50.8 ms, CL= 45.1-56.5 ms) with respect to FP. These differences supposed between 1.32-1.62 cm in SJ and 4.7-8.4 cm in EJ (jumps among 20-40 cm, respectively). Jump height did not affect them ($r = -0.201$ and $r = 0.08$, respectively). The differences FP-EJ increased when the jump direction was transversal (57.1±52.6 ms) with respect to longitudinal direction (44.3±39.6), while this was not relevant in FP-SJ differences (10.8±2.1 and 10.5±1.7, respectively). Correlation between FP and SJ (Figure-1a) was higher than FP and EJ one (Figure-1b). CV for EJ (6.61±4.81%*) was higher than FP (1.19±0.78%) and SJ ones (1.21±0.81%).

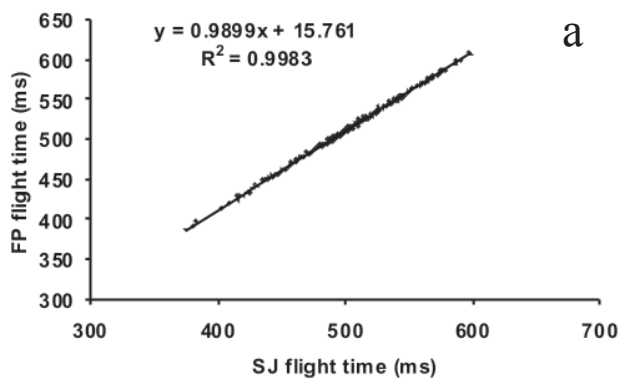


Figure 1. García López, J, et al. Correlations among the flight time with PF and SJ

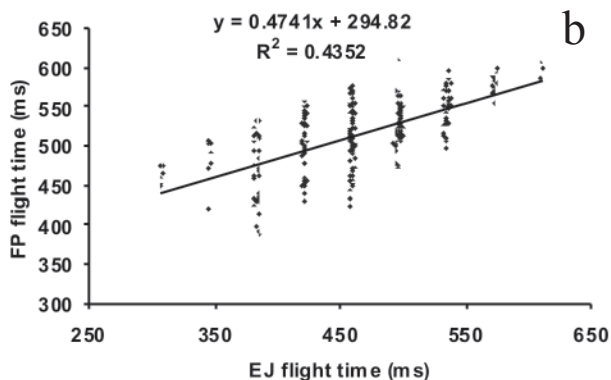


Figure 2. García López, J, et al. Correlations among the flight time with PF and EJ

Conclusions: Contact mat technology (mechanics vs. optoelectronics) affects vertical jump height (1.9-3.4 cm for jumps among 20-60 cm). Some optoelectronic contact mats (e.g. ErgoJump Plus) should be validated before using them in scientific studies. SportJump System Pro is a valid and reliable contact mat, and its new software corrects the differences in Ft with respect to FP.

Key words: Vertical jump. Contact mat. Instrumentation.

Kinematics and biomechanics in finswimming - comparative analysis of underwater undulatory stroke in swimmers versus dolphins

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Introduction: Finswimming is a sport practiced with monofins, swimming like the motion of dolphins. Vertical displacement of the body during the stroke cycle is in the form of wave like, starting propulsive motion at the hip level, increasing amplitude of oscillations from hip to ankle.

Dolphins tail follows a sinusoidal pathway, which is symmetrical about longitudinal axis of the body and in time. The posterior one-third of the body was bent to effect dorsoventral movement of the flukes. The aim of research was to analyze differences of swimming technique between finswimmers and dolphins and to find possibilities for improving technique in finswimming.

Methodology: In the research project comparative analyses method was used. Data base was formed from previously performed and published researches, analyzing kinematics parameters in finswimming or dolphins swimming, apart. In this research we collected data from analyzed previous researches and made comparative analyses. Also, it was analyzed two types of swimming performance: slow and fast swimming periods. Also, we compare parameters of average swimming performance.

Results: During fast swimming dolphins achieve greater amplitude than swimmers, 1m according to 0.5m, respectively. In fast swimming period swimmers achieve kicking frequency up to 1.88s-1. Dolphins during fast swimming period achieve kicking frequency up to 3s-1.

During slow swimming, swimmers achieve kick amplitude value of 0.65m and kicking frequency value 0.97s-1. Dolphins develop, during slow swimming, kick amplitude of 0.5m and kicking frequency of 0.7s-1.

During swimming period, in average, swimmers develop values of 2.14s-1 of kicking frequency, but dolphins only 1.1s-1. Despite that, CM velocity in swimmers was 1.60m/s according to 2.63m/s in dolphins. Horizontal displacement values for one kick for swimmers were 0.76m, and 2.25m for dolphins. Strouhal number was for dolphins 0.3 according to 0.79 for swimmers.

Conclusion: During swimming performance, swimmers and dolphins develop kicking frequency values comparatively to CM velocity. Kicking amplitude for swimmers was in reverse ratio with swimming velocity, but for dolphins kicking amplitude value was in positive correlation with swimming velocity. In average swimming performance, swimmers swim developing higher kicking amplitude and kicking frequency than dolphins, but achieve lower values in horizontal displacement for kick cycle. That results with lower horizontal swimming velocity than dolphins. Dolphins achieve more efficient swimming parameters than swimmers, although, swimmers have advantage in ratio tail surface/body height. Probably, the main reason for that is advantage in swimming motion kinematics chain structure in dolphins comparing to swimmers.

Key words: Finswimming. Kinematics. Underwater undulatory stroke.

BIOMECHANICS-II

Foot orthotic recommendations for the haemophiliac's physical activity

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Introduction: Ankle arthropathy is a typical lesion among haemophiliacs. Its prevention and treatment consists in, physiotherapy, orthotic aids and in admi-

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nistering coagulation factors. In gait, the ankle joint continuously receives forces that injure the synovial membrane which are, in effect, the first stage of arthropathy. It is beneficial to act on gait in haemophiliacs to cushion support by means of orthotic foot aids. The aim of this work is to describe both the characteristics of our population and our protocol regarding orthotic recommendations for the haemophiliac's physical activities.

Material and methods: Our Unit controls 331 haemophiliacs of whom 105 are severe cases. Table 1 indicates the number of severe cases per age groups and the percentage of ankle arthropathy. Clinical examinations and radiology were done in accordance with the World Federation of Haemophilia's recommendations. Our protocol includes the prescription of instrumented insoles in terms of soles from studying the uniform distribution of pressure points. The incidence of joint haemorrhaging is collected quarterly in the severe haemophiliacs group, while clinical score modifications are done yearly to assess arthropathy.

Results: 59% of our severe haemophiliacs present haemophiliac ankle arthropathy. In 2007, the incidence of haemorrhaging in ankles in haemophiliacs under the age of 10 was low. Indeed, 68.75% had no haemarthrosis events, 18.75% had a bleeding episode and only 6.25% had 5 episodes. Presently, all this age group use insoles which tend to enhance comfort in adults and children alike. However, we were unable to objectify differences related to a lower frequency of haemarthrosis events.

Conclusions: Nowadays, infant haemophiliacs' physical activity is similar to that of their healthy peers. Plasma factor levels are not always sufficient to prevent intra-articular bleeding events in weight-carrying joints. In our protocol, the use of suitable footwear with instrumented orthotics to cushion gait from forces is part of preventing arthropathy.

Table 1. The number of severe haemophiliacs per age groups at the Coagulopathy Unit at the Hospital LA FE, Valencia and the percentage of subjects with ankle arthropathy.

Key words: Haemophilia. Ankle arthropathy. Insoles.

Table 1. Pérez S, et al. The number of severe haemophiliacs per age groups at the Coagulopathy Unit at the Hospital LA FE, Valencia and the percentage of subjects with ankle arthropathy

	< 10 years	10-15 years	15-30 years	> 30 years
No. patients	16	12	38	39
% arthropathy	12.5%	25%	68.4%	79.5%

Stato-dynamical spine analysis and trunk posture – comparing ultrasound based vs. Optical based measurement system

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Introduction: Posture relevant parameters can be measured by numerous measuring systems using different technologies but there is a lack of comparison of different technologies in the literature. The aim of the study was to evaluate different methods (ultrasound based versus optical based) in stato-dynamical spine analysis and posture (zebris® CMS HS versus Formetric®) regarding accuracy and elaborate benefits as well as disadvantages in application.

Methods: 32 patients (17 male; 15 female) within the age of 27,7(± 6,2) years participated in this cross section study. Anamnesis' questionnaire regarding sport injury and pain was interrogated. Patients were measured thrice with both systems. Statistic evaluation was done according to Bland/Altman (1986) as well as Spearman's correlation calculation using SPSSv11.5 and Excel 2003

Results: Comparing measured values a wide congruence could be demonstrated with marginal underestimating in kyphosis and lordosis data for the ultrasound based system. The largest deviation could be shown for pelvic obliquity measured in mm. Trunk inclination, vertical deflection of a pelvic obliquity measured in degree showed proper analogy for both measuring systems. Validity, reliability based on particular technical principles could be verified.

Discussion: In summary both systems revealed usable quality in specific applications. The manual performance in using the ultrasound based system bears the risk of cumulated errors during measurement. Working with the ultrasound based system pelvic oblique is an accident-sensitive parameter. Versatile applications such as static or dynamic measurements could be done with the ultrasound based

system. Differences in axial balance in the range of physiologic motion can be calculated under dynamic conditions, and compared to normative data. The contact free and quick done rasterstereography allows with the help of surface back analysis to supplement radiological and clinical examinations of the spine in orthopaedic and biomechanic questions.

Analysis of muscular responses to imbalance situations in young individuals with Down syndrome

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Background: Musculo-skeletal system is affected in Down syndrome (DS) pathology. Muscle hypotonia and joint hiperlaxity factors contribute to orthopaedic anomalies which lead to postural alterations. Muscle response is characterized by slowness, increased reaction times, co-activation and variability. Movements are clumsy (slow and variable). DS subjects experience delays in motor performance, including static and dynamic balance.

Our hypothesis is that young DS's activate their ankle muscles in a different way than control subjects during quiet upright stance. To counteract centre of mass perturbation secondary to voluntary arms movement DS individuals increase muscular co-activation.

So the purposes of our study are to examine the ankle muscular activation and how it is modified depending on support conditions (monopodal/bipedal) and on sensory input conditions (open/closed eyes), and to analyse differences in muscular co-activation when quiet standing is perturbed by voluntary arm movements in each condition.

Methodology: Descriptive and comparative analysis of muscular activation pattern between DS individuals (n=17, mean age= 18,9 and SD = 1,6) and age matched controls (n=17, mean age = 21,4 and SD=3,4). Electromyographic activity (EMG) of right ankle postural muscles were recorded: tibialis anterior, soleus, medial and lateral gastrocnemius. Muscular activity was recorded while maintaining bipedal and monopodal stance in open and closed eyes condition for each one. Also they were recorded while performing bilateral shoulder voluntary flexion/extension movements in bipedal/monopodal and open/closed eyes conditions.

Results: DS subjects presented higher EMG activity in bipedal upright stance; EMG bursts were larger in monopodal stance. Absence of visual inputs didn't affect activity levels. DS subjects didn't showed increased muscular co-activation when compared to control subjects.

Conclusions: Observed differences in balance and muscle activation in DS subjects suggest the convenience of training programs directed to accomplish improvements in balance and in muscle performance modulation.

Key words: SEMG. Down syndrome. Balance.

Cocoontraction of internal and external oblique muscles during maximal strength tests in professional tennis players

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Introduction: Repetitive and quick flexion-extension and rotation activities, as serves or forehand and backhand strokes in tennis seem contributing factors to develop pelvic and spine disorders and pain. The aim of this study was to analyze the amplitude of the electromyography (EMG) of internal and external oblique (IO and EO, respectively) during six maximal strength tests that mimic the posture of the trunk and arms in different tennis strokes.

Material and methods: Five professional male tennis players, without current back or shoulder pain, volunteered to take part in this study (higher ATP rankings: 50, 65, 161, 183 and 246; age = 26.2 ± 2.3 yr, height = 181.5 ± 3.4 cm, mass = 80.3 ± 4.9 kg). After warming-up, subjects were positioned in a sat posture, with the pelvis strapped, while holding a steel cable handle attached to a wall. Then, subjects pushed against the handle to produce their maximum isometric force. The cable was oriented in different directions in order to mimic three tennis techniques: service, one-handed stroke and two-handed stroke. Each

technique was performed three times in both sides of the body (6 maximal tests x 3 trials = 18 trials). Superficial EMG (Muscle Tester ME6000, Mega Electronics Ltd.) was recorded bilaterally from IO and EO. The EMG signals were full wave rectified, averaged every 0.01 s, and then normalized to trunk maximal voluntary isometric contraction amplitudes (MVIC).

Results: Table 1 shows the normalized maximum muscle activities for each of the maximal tests.

Table 1. Vera-García FJ, et al. Averages (\pm SD) of the maximum normalized EMG amplitudes (% MVIC)

TESTS	R-EO	R-IO	L-EO	L-IO
Service-right	22.11 (12.79)	51.58 (22.19)	47.02 (28.19)	76.94 (38.76)
1 hand-right	36.75 (32.75)	51.22 (24.50)	39.46 (26.86)	69.11 (21.00)
2 hands-right	45.56 (37.63)	31.04 (10.29)	24.16 (13.48)	78.27 (41.79)
Service-left	56.09 (29.63)	42.97 (8.05)	9.17 (1.94)	49.52 (30.92)
1 hand-left	55.78 (49.26)	35.80 (11.76)	13.59 (4.25)	56.89 (39.04)
2 hands-left	34.75 (11.13)	77.12 (32.18)	30.77 (4.83)	33.87 (23.92)

Nomenclature: R- right; L- left; EO, external oblique; IO, internal oblique

Conclusions: Muscular agonist-antagonist cocontraction was observed during the maximal strength tests. Maximal trunk exertions impose high forces on the spine that may produce some damage on the tissues. Probably, the cocontraction reported in this study could be necessary to assure spine stability while pushing against the handle.

Key words: Electromyography. Muscular cocontraction. Tennis.

Benefit of the use of trainers with pronacion control in runners with supports you will plant

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The presence of ligamentous hyperlaxity, that is, insufficiency of the first radius, and flat feet are the main anatomical and morphological characteristics that cause long-distance runners, both professional and amateurs to suffer from certain injuries, such as periosteum tibial, iliotibial band syndrome or even chondromalacia of the patellar.

In orthopedology, these patients are usually treated with sole supports (insoles) that control support deficiencies or the excess of movement of certain joints.

When physiotherapy is applied to these patients, electrotherapy is also prescribed in order to relax the fascia plantar and to stimulate the inner compartment of the front leg area.

In this essay we are trying to show the variation in Helbing's line in long-distance runners who use sole supports (insoles) in neutral running shoes and shoes with pronation control. A decrease of injuries is consequently observed in runners that present the aforementioned characteristics, thanks to the supplementary aid of running shoes with pronation control.

Therefore, we can say that by means of the use of double density shoes or shoes with pronation control by runners that run an average weekly distance of 60-80 kilometres, on different grounds and with different intensity intervals in their training sessions, the appearance of injuries diminishes in a considerable way. This is because this type of running shoes contribute to the lateral and longitudinal stability of feet in their the training sessions, an aid which is so necessary when the runner feet muscles are worn out and that the sole support (insole) is not capable of a control on its own.

Key words: Ligamentous hyperlaxity. Pronation. Electrotherapy.

BIOMECHANICS-III

A new ergometer is designed for wrestling sports

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Introduction: No many devices are designed for so many sports in the world, and every time Scientifics need a specific test to know how the body, in term of physiological answer, works. Once the body starts to move, the movement has to be as close as possible to the specific work during the real competition, so the coaches, helped for sport physicians, can get the optimal performance from their athletes. This work shows us how to build an ergometer for wrestling sports.

Material and methods: Mechanical engineer tools are used to build a sophisticated and, at the same time, simple, device to test force and velocity in men or women who play wrestling or similar sports. Using the computer and a dedicated software to build such a device, the authors try to be faithful to the real wear out of a body exposes to hard work, in this case, against a machine. The system is made of six different sensors, which are Charged Cells, located in strategic positions. These cells let us "compute" the power transferred by the wrestler.

Results: A humanoid is made to simulate the human geometry, and this is link to the land by a frame. Fifty different elements can be divided into four main components: upper body part, lower body part, frame and cover.

Conclusions: A monitoring unit let us to watch all parameters in real time, and let to the player, coach and sport physician to know all the characteristics of the movement made. This device will let to determine not only the forces, but also the contact time in every cell, in a way that we will be able to measure the applied power and the speed of our action. In another words, this ergometer will let to know the quality of the made movement.

Key words: Ergometer. Biomechanics. Wrestling.

Wrist impact during the execution of hip circles on the pommel horse in gymnastics

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Introduction: Men's gymnastics is comprised of six events, all of them produce loadings to the upper limb. The pommel horse demands repetitive and high intensity wrist impacts on a rigid structure (mean overall loading rate ranged between 5,3 BW/s to 10,6 BW/s), with sustained periods of body weight support on the wrist (Marklof, et al. 1990). The purpose of this study was to analyse the impacts and the loading rate received by the gymnasts during the execution of circles on a mushroom apparatus, used to improve techniques of the pommel horse.

Method: We established four phases for a complete circle on the mushroom, two double support phases (Phases A and C) and two single support phases (Phases B and D). Four male gymnasts of the national team, one Olympic level and three junior international level, performed two series of ten circles on the mushroom. The mushroom was placed over a force platform at a sample rate of 1000hz. Performance was recorded with one high speed camera with a sample rate of 200hz and another one at 50hz. The event was captured at the same time on the force platform with high resolution cameras to synchronize the data collection prior to the performance.

Results: Gymnasts of the study took a mean of 0.927 ± 0.032 seconds to do a circle, and spent 72% of the time during single supports and 28% during double supports.

The resultant force increased to maximum values of 1.77 ± 0.17 BW, always on the arrival of carpus on double support phases, and showed a mean loading rate of 10.66 BW/s.

Impulse during single support phases was 0,15 x BW higher than in double supports.

In the instant of maximal lateral forces (single supports) gymnasts demonstrated an average wrist extension of $86,3 \pm 4,0^\circ$.

Discussion/Conclusions: As the young gymnasts execute hip circles on the mushroom to learn specific skills of pommel horse during the learning period, concomitant to the growth period, and those exercises produce important impacts, high loading rates and risky angles of extension of the wrist has been observed in our study. We postulate that the impact of the time loading depending on the maturation process of the athlete and a clinical evaluation of the wrist (signs, symptoms and complementary tests) had to be taken into account on the evolution of the athlete.

Key words: Gymnastics. Impacts. Pommel horse.

Evaluation of the strength deficit after surgery intervention by the use of a maximal isometric force test and anthropometric measurement

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Introduction: Even though it has been proved that big differences exist between dynamic and isometric muscular performance (Baker, *et al.*; 1994), the reproducibility (Heinonen, *et al.*; 1993) and specificity of the isometric test, turns it to an optimal system for the evaluation of the contractile capacity of the muscle, especially when the athlete cannot execute a dynamic test because of a limitation his/her movement's amplitude (González Badillo, Gorsostiaga; 2002). Many Literature from different authors can be found about the use of this methodology for the measurement of asymmetry on bilateral strength (Impeleizzeri, *et al.*; 2007) and have determined that differences larger than 10 - 15% are closely related to higher predisposition to injury (Herzog, *et al.*; 1989 Impellizzeri, *et al.*; 2007; Petsching, *et al.*; 1998).

Muscular areas can be calculated from the measurement of skin fold and muscular perimeter, and are used as an indirect indicator of the level of a segment's hypertrophy (Banquells, *et al.*; 1992).

The aim of this study was to evaluate the recovery level of an athlete that underwent surgery because of a patellar transverse fracture, by the use of an isometric leg press exercise test and an anthropometrical evaluation of the muscular area of the middle thigh.

Method: An international level gymnast incorporated to the training routine from a medical surgery 16 months before, passed an evaluation of the leg's strength by means of a maximal isometric leg press test with each leg separately and simultaneously. The protocol demanded to reach the maximum isometric force in the shortest time possible and to maintain it for 5 seconds. The subject performed 2 attempts, with a recovery time of 1 minute, and the one with the highest mean force value at 200ms (Hamar; 2008) was selected for the analysis. The leg press (Salter, series M487) used for this study was equipped with a load cell (AEP Transducers, model TCE).

Anthropometric evaluation of the muscular area was done the same day, measuring the muscular perimeter and the anterior, internal and external skin fold of the middle thigh.

Results: The athlete developed an absolute maximal isometric bilateral force of 2870N. Analyzing the unilateral attempts, a 15% deficit of isometric force was found on the operated leg, and a 12% deficit of explosive force, with respect to the non-operated leg. In the same way, an 8% deficiency of muscular area was observed on the operated leg's middle thigh, during anthropometric evaluation.

Discussion/Conclusions: The evaluation tests showed a clear deficit on isometric and explosive force and on muscular hypertrophy of the injured leg. The use of a combined protocol, mixing a maximal isometric strength test and an anthropometric evaluation, can be a useful tool for the detection of muscular deficiencies on athletes that have returned to training sessions after surgery.

Vertical jump test and anthropometry for the assessment of bilateral strength asymmetry after injury

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Introduction: Functional evaluation has been used to identify the readiness of an athlete to the normal level of activity. Vertical jump has been observed as a reliable functional task to reach this goal. It has also been found a valid and reliable exercise to assess bilateral strength asymmetry. Bilateral imbalances may affect performance, and differences greater than 10-15% have been reported as a predisposing factor for injury. Muscle transversal area is related to force production and can be indirectly measured with the proper anthropometric methodology. The purpose of this study was to evaluate the functionality and the bilateral symmetry, applying a vertical jump protocol test and an anthropometric evaluation, of a single athlete after being recovered from surgery of a transversal patellar fracture 16 months before.

Method: The subject of this study was a male gymnast recovered from an injury. The evaluation consisted of a submaximal half squat exercise (HS) and a vertical jump protocol tests: squat jump (SJ), countermovement jump (CMJ) and abalakov jump (ABK). All the exercises were evaluated with two force platforms (KISTLER), one underneath each leg, at a sampling rate of 1000Hz. After a warm up, three trials of each exercise were performed with a rest of 45 seconds between trials. The best jump of each exercise was used to calculate

bilateral strength asymmetry through a symmetry index: (stronger-weaker)/stronger x 100. An anthropometric evaluation of the thigh muscular area was done on the same day.

Results and Discussion: Heights for SJ (27.73 cm), CMJ (33.58 cm) and ABK (42.88 cm) were under reference values of Spanish elite male gymnasts, but might be considered as normal as they are during pre-season results, where worse heights are expected compared to the competition period. In all cases the strong leg is the non-injured leg. Mean vertical force symmetry index is above 15% in HS (18.4%), SJ (18.1%) and ABK (17.36%) and above 10% for CMJ (12.9%). High asymmetries were also found in peak vertical force for SJ (22.3%), CMJ (30.3%) and ABK (14.5%). Besides the force weakness observed on the injured leg, a deficit of 8% was found in the muscular area of the middle thigh.

Conclusion: Height results obtained and lack of pain during the execution of jumps could have lead us to think that the athlete was functionally recovered. But the large symmetry index found showed the opposite.

Anthropometric results were also consistent with force results produced by each leg showing that the injured leg was not fully recovered.

The combination of a force production test and an anthropometric protocol seems to be a good methodology to evaluate functionality after injury.

Key words: Asymmetry. Vertical jump. Anthropometry.

Validation of three different jumping height measurement systems, Ergo Jump (Bosco™), OptoJump (Microgate™) and Myotest™

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Introduction: The measurement of the jump height has been used to determine the different strength manifestations of the lower extremities. The evaluation of a variety of jumps like Squat Jump, Counter Movement Jump, Abalakov Jump, Drop Jump and Repeated Jumps, will show the characteristics of the muscular mechanics: Power, elasticity, reactivity, etc. The measurement systems used for the data collection have to have high sensitivity, reproducibility, transportability, and easiness of use by the coach or athlete. A quite big amount of devices are available in the market, but there is a lack of validation of these systems. The objective of the study was to validate three easy-to-use measurement systems for the evaluation of flight time.

Method: Three measurement systems have been selected: The standard ErgoJump (Bosco system, indicated as EJ in this abstract), OptoJump (infra red cells from Microgate, OJ) and Myotest (tridimensional accelerometer, MT). The gold standard to evaluate all the systems was the force platform (Kistler). The EJ mat was placed on the FP, the OJ besides the FP and the MT was attached to a belt on the subject's hip. One subject was voluntarily collaborating on the jumping test, and performed 65 CMJ jumps without arm movement, and a pre-stretching of the muscle. All systems were required to collect flying time data from every trial.

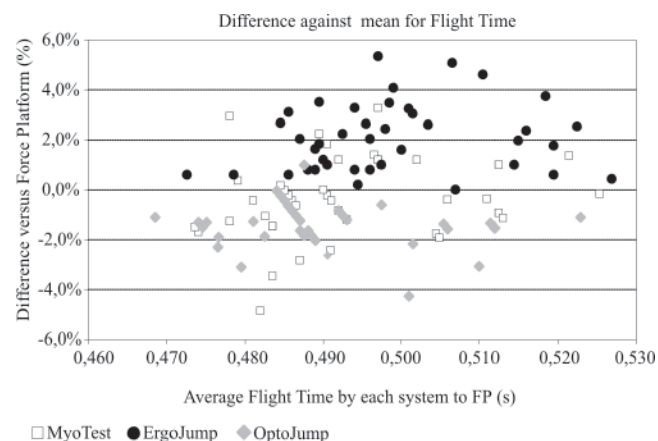


Figura 1. Roig A, *et al.*

Results: 41 jumps, out of a total of 65, were finally considered valid, because of missing values from different systems (23 from EJ and 2 from OJ). Correlation coefficient (with respect to FP): EJ R=0.842, OJ R=0.929, MT R=0.816.

Estimated limits of agreement were: EJ $-0.004s \pm 0,026s$; OJ $-0.016s \pm 0.002s$; MT $-0.018s \pm 0.014s$.

Fixed (calibration) error: EJ 2,2%; OJ -1,4%; MT -0,3%.

Variable (precision) error: EJ 1,5%; OJ 0,9%; MT 1,6%.

Discussion/Conclusions: OJ and EJ seem to have higher calibration error comparing to MT, but MT and EJ have a higher precision error. The reason of this phenomenon is, probably, related to the direct measuring parameter that each system captures. EJ and OJ record flight time, and MT records acceleration, and calculates flight time indirectly.

Confidence interval of agreement is narrower for OJ, and wider for MT and EJ, due to the lower precision error.

In some systems, reproducibility has to be improved (mainly EJ)

Even though all systems have errors, measurement of flight time is accurate enough (Figure 1).

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-I

Bilateral simultaneous avulsion fractures of the anterior superior iliac spine (ASIS) in an adolescent athlete

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The apophyses of the adolescent skeleton are areas of secondary ossification that are responsible for modulating the contour of bones and not the length. They are the sites of muscle origin or tendon insertion and are therefore subjected to traction type forces when muscles contract. These forces can cause an inflammatory apophysitis, particularly when they are chronic and repetitive. They can also result in avulsion type injuries when they are subjected to sudden explosive muscle action. These may involve avulsion of the anterior superior iliac spine (ASIS) at the pelvic origin of the sartorius muscle. ASIS avulsions arise in situations of over extension or forced extension of the hip (eg, long jump take off), forced extension of hip with flexed knee (kick a ball with force) and during episodes of stressful and simultaneous hip flexion and knee extension (sprinting).

We report a case of simultaneous bilateral ASIS avulsion fractures in a 16 year old boy when participating in a 100 metre sprint. ASIS avulsions tend to be unilateral; this is the first documented case of simultaneous bilateral ASIS avulsions. There was a sudden onset of pain in both hip areas midway through the race. He was unable to weight bear or perform active hip movements. Examination revealed diffuse swelling and tenderness at both ASIS and a pelvic X-ray confirmed bilateral avulsion fractures of the ASIS. The left-sided fragment was 3cm long and displaced 2cm caudally, with the right-sided fragment 4cm long and displaced 2cm. He was admitted to the orthopaedic ward and managed conservatively with analgesia and three weeks of bed rest with both hips held flexed at approximately 60 degrees. He was mobilised with crutches at three weeks and at six weeks was pain free with a complete range of hip movements. Following a course of physiotherapy rehabilitation he was able to return to full activity by eighteen weeks post injury.

Anterior superior iliac spine avulsion can be managed conservatively or by open reduction and internal fixation. Internal fixation (IF) is preferred if the fragment is displaced more than 2-3cm, or if the athlete needs a speedier return to sports participation, particularly at a high level of performance. Conservative treatment involves bed rest, anti-inflammatories, graded mobilisation and weight-bearing under physiotherapy guidance. Complications of ASIS avulsion include bony exostosis formation, non-union of the fracture and meralgia paresthetica.

Key words: Sports injuries. Fractures. Treatment.

Vascular sclerosis in patellar tendinosis

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Nowadays patellar tendinosis represents one of the most frequent injuries in sport mainly in disciplines in which jump is the most characteristic gesture.

At the moment the theoretical model of degenerative pathology of the tendon (tendinosis) is sometimes accompanied with vascular changes (neof ormation of vessels) being this one the causes of the accompanying pain.

We presented the case of a patellar tendinosis a basketball player of the ACB league season 2006/07 aged 27, 212 cm of height and 108 kg of weight, that not respond of conventional medicine or physiotherapy treatment after 6 months of evolution. The ultrasound study with a Acuson CV70 machine (Siemens) with a linear high-frequency 5-10 Mhz shows a thickening the sinew with loss of the fibrillar pattern and hypoechoic areas. With Doppler colour we appreciated neovascularisation in the proximal third (insertion zone of the inferior pole of the patella).

As a continuation of the treatment it was decided the sclerosis of the neovessels with Polidocanol to 2% (2c.c.) with 40x40 needle and guide by linear high resolution ultrasound. The final result to the 60 days post-treatment and after two injections with 10 days of interval between both was satisfactory. According to score of the Victorian Institute of Sport Assessment (0-100 points) before the treatment 55 points; after the treatment 90 points (improvement off 35%) and according to visual analogical scale (0-10) before treatment 4 and after treatment 9 (improvement of 50%). The size of the vessels showed a significant reduction until almost disappearing.

As a conclusion the sclerosis of vessels in the treatment of the patella tendinosis with neovessels may be effective.

Key words: Sclerosis. Patellar tendinosis.

Protocol to conservative treatment and costal rehabilitation for diagnosis of disc protusion in amateur athletes

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Introduction: Low back pain is common problem that impossibility the training maintenance in amateur athletes. Much of these patients have a lumbar disc protusion that promotes soft nerve compression. This study aims to demonstrate that the combination of physiotherapy techniques can help the rehabilitation, following the premise that it is necessary to reduce inflammation, relieve compression and strengthen the muscles.

Materials: Twelve amateur athletes, six men and six women, between 19 and 45 years old with acute low back pain and disc protusion diagnostic by nuclear magnetic resonance, without medication.

Methods: The group was subjected to a 12 weeks protocol of treatment, with 2 sessions per week. The protocol was divided into 4 weeks of conventional anti-inflammatory physiotherapy, 4 weeks of decompression by global postural reeducation technique and 4 weeks of strengthening muscle by Pilates therapeutic exercises.

Results: 8 athletes (66,6%) returned to sports activity without pain after 12 weeks. 2 athletes (16,6%) reported mild pain and insecurity in practice of sports after ended the protocol. 2 athletes (16,6%) reported constant pain and unable to return to the sports.

Conclusion: A combinate physiotherapy treatment show itself a great option in non-invasive costal rehabilitation, without medicines, to disc protusion diagnostics.

Key words: Back pain. Protusion. Treatment.

The methods and instruments of evaluation to measure hamstring flexibility. A systematic review

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Background: With the habitual sports practice an increase of the volume, force and muscular power in detriment of the flexibility is produced. The frequency of the shortened hamstring is quite frequent and can be related to the sports practice. Thus same, so much the diagnostic methods utilized as the limits of normality

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established, they can influence in the results of the appraisal. In this study a systematic review of the scientific literature is carried out for: 1) to identify methods and instruments of evaluation utilized to measure the flexibility in the hamstring muscles; 2) to verify the frequency of its employment in experimental studies; 3) to identify the population studied; 4) to analyze the methodological quality of the studies.

Methods: Two authors identified through of manual search (magazines specialized and expert) and electronic means (COCHRANE, MEDLINE, PEDro, LILACS), 39 articles of investigation that complied with the criteria of selection. The limits included: i) works carried out between 1977 and 2007; ii) articles published or done not publish; iii) in the Portuguese, Italian, English, French, Spanish, and Catalan languages; iv) that incorporated a treated group and a control group; v) as a minimum 5 subjects by group; vi) unlimited of age. The appraisal of the methodological quality was established in a scale of the zero to the eight.

Results: The instrument and the most utilized method of evaluation in the studies they are the manual goniometer (53.8%) and the measure of the popliteal angle (51.3%). The subjects that presented lower values to 80° in the test of the straight leg raise (SLR) and limitations of more than 20° in that of the popliteal angle (AP) they were classified as subjects with shortening in the hamstring muscle. It was verified that the type of population included in the articles they were in greater measure subjects with shortening (61.6%), followed by the done not shorten and mixed (both cases with the 6%). The methodological quality reached a rank between 1 and 7 (mean 4.73 and SD 1.30).

Conclusion: The methodological quality was acceptable. The methods of evaluation utilized in the studies are based on angular measures as the AP and SLR. The most employed instruments were the manual goniometer, followed by the electronic one, inclinometer and flexometer. According to the angular limits for the AP and SLR the major percentage of the population studied concentrates on subjects that present shortenings.

Key words: Flexibility. Hamstring and Range of Motion.

Femoral monostotic fibrous dysplasia in professional elite athlete. Case report

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Introduction: Fibrous dysplasia is a bone disorder caused by the formation appearance of fibrous-bone tissue inside the affected bone. Although its etiology is unknown, it is related to mesenchymal osteogenic disorders and it appears in the shape of one injury (monostotic) or multiple injuries (polyostotic). The latter, when associated with precocious puberty, premature skeletal maturation, hyperthyroidism and "café-au-lait" (Coffee with milk) spots, constitutes Mc Cune-Albright syndrome.

The monostotic type generally affects the femur, tibia, ribs and base of the cranium, usually being located in the bone diaphysis and it rarely extends to growth or articular cartilage. It is more frequent among teenagers and is generally asymptomatic, although it may cause pain, swelling, deformity or pathologic fracture. Treatment depends on the presence of complications.

Clinic case study: Professional athlete, 31-year-old male, who is studied by NMR (Figure 1) on both thighs by overlanding of repetition in flexor muscles of the left knee. This test shows an extense intramedullary injury in the right femoral diaphysis, with expansion and slimming of the cortical, though there is no destruction of itself nor soft tissues affectation, with low sign intensity at T1 and high at T2 and STIR, which suggests fibroses dysplasia.

Once this data was obtained, a right femur TAC (Figure 2) was requested. It showed the presence of an intramedullary injury of 10 cm, which increased the bone tubulation with cortical thinning at the antero-externa side. It also showed a faint image of higher density in the reconstructions, which delimits the injury of the normal medulla. Small calcifications were also found at the axial cuts, without any soft tissues alterations, being all this compatible with the diagnosis of fibrous dysplasia.

In the performed gammagraphy (Figure 3), a hyperfixation was also found in the union of the middle and upper third of the right femoral diaphysis, of more marked characteristics in the cortical margins, in relation with a unique osteogenic reaction at that level.



Figure 1. Beas Jiménez JD, et al. RNM image in right femoral diaphysis.

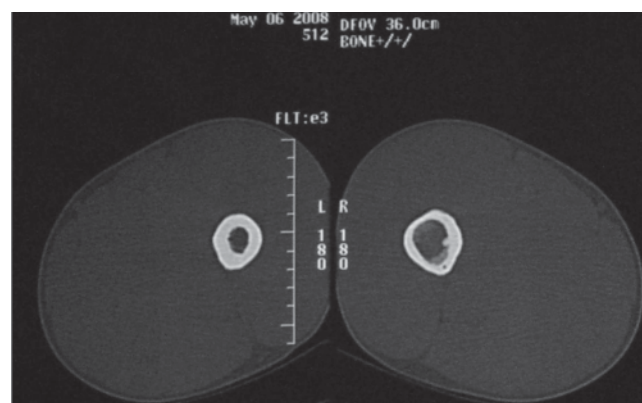


Figure 2. Beas Jiménez JD, et al. TC image femoral diaphysis

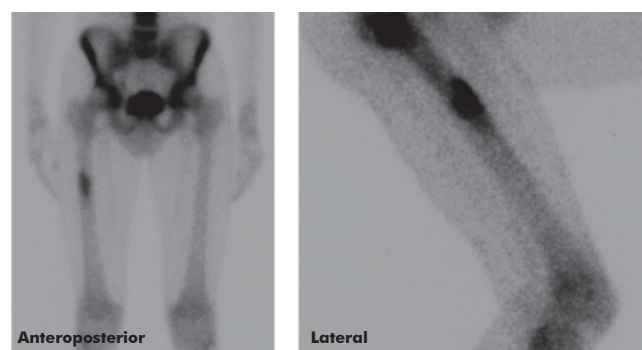


Figure 3. Beas Jiménez JD, et al. Scintigraphy

Considering the asymptomatic clinic and the results of the complementary explorations, it is decided to hold an expectant attitude with annual reviews (unless appearance of symptomatology).

Discussion: We have not found bibliographical references with regard to its appearance in elite athletes and therefore we do not know the long term influence of the practice high-level sport. In the case that we present, given the absence of symptomatology and the schedule of the sportsman, the best option was to keep to adopt a wait-and-see approach.

Key words: Fibrous dysplasia. Elite sports.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-II

Application of an hyperpolarize electric current in muscle elongation injuries

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Introduction: In a recent paper¹ we explained preliminary results about the benefits of using hyperpolarize electrotherapy in treating some muscle injuries (torn muscle fibres grade 1 and 2). We rely on the fact that the capacity of regeneration of damaged muscle fibre depends on its ability to maintain the membrane polarity² and we apply a hyperpolarized electric current to help repair processes before muscle fibres degenerate and have to be degraded. This paper shows preliminary results of applying this type of treatment in muscle elongations.

Methods: 8 elite athletes diagnosed with muscular elongation were treated consecutively in the Andalusian Sports Medical Centre in Sevilla, Spain (four males and four females aged 23.88±8.92 years). The control group (n=4) received usual treatment (massages, ultrasounds, magnetotherapy and microwave). The experimental group also received electrotherapy treatment during the first four days after the injury (3 applications of 5 seconds with 2 seconds rest). The protocol was applied once a day. We considered that the downtime was the time elapsed between the injury and the start of physical activity and that the recovery time, was the time elapsed between the initiation of therapy and the return to normal training.

Results: Table 1.

Table 1. Beas-Jiménez JD, *et al.*

Variable	Control group		Experimental group		p valor
	Media	DS	Media	DS	
Downtime	8.33	2.52	2.40	2.88	0.029
Recovery time	10.50	0.71	6.40	2.61	0.024

Conclusion: The implementation of an electrotherapy protocol can shorten the downtime and recovery in muscle elongations.

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Key words: Muscle injury. Elongation electrotherapy.

Electrodiagnostic study on the normative value of distal sensory nerve conduction of the superficial peroneal nerve in Korean adults

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Introduction: Ankle sprain injuries can cause damage to the distal branches of the superficial peroneal nerve (SPN) but the extent of neuropathy of these distal branches is still a controversial issue due to the paucity of information on the normative values and innervations patterns. This research was carried out with aims to determine the normative values of the medial dorsal cutaneous nerve (MDCN) and intermediate dorsal cutaneous nerve (IDCN) of the superficial peroneal nerve in healthy, asymptomatic Korean adults.

Methods: 19 legs from 19 healthy volunteers (male 9, female 10, mean age 28.7±4.4) with no previous history of sciatic or peroneal neuropathy, or of ankle sprain injuries were included. Antidromic electrodiagnostic study of MDCN and IDCN was performed using Synergy electromyography (Medelec Ltd., Surrey, UK) with a distance of 10cm between the stimulating and recording electrodes.

Stimulation was performed at 50% and 25% distance of the intermalleolar line from the lateral malleolus to stimulate the MDCN and IDCN, respectively.

Results: The mean sensory nerve action potential (SNAP) amplitude, peak latency, onset latency and conduction velocity values of MDCN to the great and third toe was 7.0±2.9µV/2.8±0.7ms/2.1±0.5ms/42.7±11.7m/s, and 8.5±2.9µV/2.6±0.7ms/2.0±0.3ms/49.9±7.8m/s. For the IDCN to the fourth and fifth toe, the normal values were 7.3±4.0µV/3.0±1.0ms/2.2±0.8ms/38.9±17.5m/s and 6.0±2.6µV/3.3±0.6ms/2.4±0.5ms/41.5±12.0m/s. Of note, 26.3% (5 cases) showed absent response in the fifth toe with IDCN stimulation and showed positive response with subsequent sural nerve stimulation, indicating aberrant innervation pattern of the sural nerve to the fifth toe.

Conclusion: Absent SNAP response with IDCN stimulation should raise suspicion of an aberrant innervation pattern from the sural nerve. The results from this study may be of clinical use in the electrodiagnostic diagnosis study of the distal sensory branches of the superficial peroneal nerve associated with ankle and foot injuries.

Key words: Superficial peroneal neuropathy. Ankle. Innervation.

A case report of winged scapula caused by rhomboideus muscle rupture, diagnosed with musculoskeletal sonography

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Introduction: Winged scapula is commonly associated with nerve injuries to the long thoracic, spinal accessory or dorsal scapular nerve but there have been rare cases where it has been linked with direct rupture of the rhomboideus or trapezius muscle. We experienced a cause of rhomboideus muscle rupture which was diagnosed with musculoskeletal ultrasonography.

Method, Results: A 36 year old male patient visited our clinic complaining of unilateral scapular motion discomfort and a sensation of scapular dyskinesia with stiffness that had developed after he had previously sustained a "popping injury" from heavy weightlifting activities. Physical examination revealed winged scapula with lateral translocation, combined with lateral rotation of the inferior angle. Slight wasting of rhomboideus muscle bulk was detected and manual muscle test showed decreased motor power. Nerve conduction and needle electromyography study failed to reveal any evidence of myopathy, brachial plexus injury or other neuropathy. Supplementary laboratory tests were nonspecific. Musculoskeletal ultrasonography study was performed which revealed decreased fibrillary pattern and hypoechogenicity of the middle fibers of the rhomboideus major muscles of the affected side. We arrived at a clinical diagnosis of partial rhomboideus muscle rupture of the middle fiber. The patient underwent a strengthening program of the dorsal scapular muscles. Six months after initiation of physical therapy, the patient showed improvement of scapular asymmetry and scapula dyskinesia.

Conclusion: Musculoskeletal ultrasonography could be a useful tool in the diagnosis of winged scapula not related with focal neuropathy.

Key words: Ultrasonography. Rhomboideus muscle. Scapula.

A case report of axillary neuropathy associated with quadrilateral space syndrome due to arteriovenous malformation

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Introduction: The quadrilateral space is a passageway bounded by the long head of triceps brachii medially, the surgical neck of the humerus laterally, the teres minor muscle superiorly, and the teres major inferiorly. External compression of the axillary nerve within this space, also known as quadrilateral space syndrome, can present with clinical symptoms consisting of diffuse posterior shoulder pain, arm fatigue, and has been previously linked to paralabral cysts or arterial anomalies such as aneurysm or subclavian artery compression. The authors have experienced a rare case of axillary neuropathy related to arteriovenous malformation which compressed the axillary nerve around the quadrilateral space and which resolved with proper surgical management.

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Case: A 28 year old male visited the outpatient clinic complaining of wasting of the left deltoid muscle bulk. He had no previous history of trauma or injury but had participated in heavy-weight lifting activities. Physical examination revealed muscular atrophy and weakness of the left deltoid and teres minor muscles. Electromyography study showed evidence of left axillary neuropathy. The patient underwent magnetic resonance imaging study (MRI) to evaluate for structural anomalies. Results showed compression of the left axillary nerve in the quadrilateral space by an anomalous vascular malformation. Exploratory surgical operation was performed which confirmed the presence of arteriovenous malformation in the quadrilateral space and proper ligation of the lesion was performed. The patient underwent a rehabilitation program and showed a gradual improvement of muscle bulk.

Conclusion: This is the first case report, according to the author's knowledge, of axillary neuropathy related to an arteriovenous malformation around the quadrilateral space.

Key words: Shoulder pain. External nerve compression. Muscular atrophy.

Effectiveness of the physiotherapy before a syndrome of reduction of hamstrings muscles

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Centro Andaluz de Medicina del Deporte de Málaga

Purpose: Shortened hamstrings are frequently detected among high-level athletes, such as runners. Working with an athlete with this pathology helped us to prove that physiotherapy treatments can alleviate this syndrome.

Methods and materials: 21-year-old, male patient, semiprofessional road race walker. Shortened hamstrings were found in both legs, especially the left. Pain and functional incapacity had progressed over 2 weeks. The range of movements appeared to be anomalous both for external hip rotation and for hip flexion with knee extension. Trunk flexion test and finger-floor distance provided low ratings. Goals of physical therapy: Relieving the pain, recovering agonist- antagonist balance and recovering the global flexibility.

Treatment was carried out for 3 months, distributed in 1-hour sessions:

- Analgesy protocol through electrotherapy
- Cyriax massage maneuvers and massage therapy
- Programme of exercises for the pelvic and knee - flexion muscles
- Designing and making a shoe sole.

Results: The improvements showed up in the increase of the range of the hip flexion with knee extension, the decrease of pelvic retroversion and a recovery in external hip rotation back to normality. Pain decreased in the left biceps femoris muscle and functional incapacity disappeared while resting and running.

Findings: As shown by this case, physiotherapy played a key-role in the athlete's recovery. A strict and ruled follow-up of the treatment allowed our patient to readapt to activity. In addition a sanitary education programme was recommended, as well as the necessary medical controls.

Key words: Hamstrings. Shortening. Physiotherapy.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-III

Effects of a workplace exercise intervention on flexion relaxation response, disability and perception of occupational low back pain

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Background: Impaired neuromuscular activation is an area of specific interest in patients with chronic occupational low back pain (OLBP). The flexion relaxation ratio is an index of alteration of motor control on lower back. There is inespecific evidence about the effects of workplace exercise intervention in this measurement.

Objective: The aim of the study is to evaluate whether the active or passive phases of the flexion relaxation measurement change following a workplace lumbopelvic exercise intervention of 5 weeks in patients with OLBP.

Methods: Fifty two (38 women and 14 men) health professionals working in a geriatric hospital; mean values: Age=44, height= 161 cm, and weight = 67 Kg) with occupational OLBP performed a 5-week training intervention. The main outcome measures were the Roland Morris Questionnaire, visual analogue scale, and flexion relaxation response analyzed by the root mean square (RMS) signal and the flexion relaxation ratio (FRR).

Results: After intervention, disability ($P<0,05$) and pain ($P=0,02$) scores improved significantly. There were no changes in the active components of the flexion relaxation measurement flexion ($P=0,703$) and extension ($P=0,835$) but there were significant changes in RMS ($P<0,001$) measured during the relaxation at full trunk flexion. FRR showed a significant increase ($P<0,001$) following 5 weeks of treatment.

Conclusion: These data have provided an evaluation of the flexion relaxation testing procedures and demonstrated changes over time following a workplace exercise intervention of 5 weeks. Workplace exercise interventions are an effective method for improving an altered flexion relaxation response in patients with occupational low back pain.

Key words: Low back pain. Exercise. Surface electromyography.

Sport injuries treated in CAR of Sierra Nevada and its relationship with the type of sport

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Introduction: Elite sport requires many hours of training. Implies high stress of the musculoskeletal system that results in a high % of injuries. Sport injuries are an important part of the elite athlete health problems. A sports injury involves any anatomical region maybe related with the sport practiced. The relationship between sports injuries and possible causative factors are important for a better understanding of the subject and better prevention.

Objective: We present the relationship between sport injuries treated in the CAR Sierra Nevada and the type of sport practiced.

Material and method: The study population included 89 elite athletes treated in a period of 8 months and residents in the CAR of Sierra Nevada.

Results: Mean age of 26.4yrs (SD: 7.8) (47.2% males and 52.8% females). 6% canoe, 15% alpine skiing, 5% climbing, 28% athletics, 24% swimming, 5% wrestling and 6% badminton. These sports were categorized according to anatomical region used in this sport. Sports were classified in Global Sports (GS): canoe, climbing and wrestling), Lower Extremity Sports (LES): alpine skiing and athletics, High Extremity Sports (HES): badminton and swimming. 18% of the population were GS, 48% LES and 34% HES. During this period of time, 10% were treated about Fibre Rupture (FR), 13% Vertebral Pain (VP), 41% Delayed Onset Muscle Soreness (DOMS), 20% about Tendinopathy (T) and 5% of Enjuries Joint (EJ). SPSS 15.0 software was used for the statistical study. Comparison between age and type of sport (ANOVA) showed no significant differences ($p=0,001$). EJ are the most treated with 5.2 mean sessions (SD:1.6). Comparison between injuries and sport showed no significant differences ($p=0,734$). DOMS are the most frequent injuries in LES.

Conclusion: We didn't find relationship between type of sport and injury pathology described.

Key words: Sports injuries. Elite sports. Treatment.

Efficacy of physiotherapy in hamstring syndrome

López Porcel M, Sánchez Arjona C

Centro Andaluz de Medicina del Deporte de Málaga

Purpose: Shortened hamstrings are frequently detected among high-level athletes, such as runners. Working with an athlete with this pathology helped us to prove that physiotherapy treatments can alleviate this syndrome.

Methods and materials: 21-year-old, male patient, semiprofessional road race walker. Shortened hamstrings were found in both legs, especially the left. Pain and functional incapacity had progressed over 2 weeks. The range of movements appeared to be anomalous both for external hip rotation and for hip flexion with knee extension. Trunk flexion test and finger-floor distance provided low ratings.

Goals of physical therapy: Relieving the pain, recovering agonist- antagonist balance and recovering the global flexibility.

Treatment was carried out for 3 months, distributed in 1-hour sessions:

- Analgesy protocol through electrotherapy.
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Results: The improvements showed up in the increase of the range of the hip flexion with knee extension, the decrease of pelvic retroversion and a recovery in external hip rotation back to normality. Pain decreased in the left biceps femoris muscle and functional incapacity disappeared while resting and running.

Findings: As shown by this case, physiotherapy played a key-role in the athlete's recovery. A strict and ruled follow-up of the treatment allowed our patient to adapt to activity. In addition a sanitary education programme was recommended, as well as the necessary medical controls.

Key words: Hamstrings. Shortening. Physiotherapy.

Systematic review of rehabilitative treatment in the patella-femoral syndrome

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Introduction: Patella-femoral syndrome (PFS) is a clinically common in young adults characterized by pain in the front of the knee. The goals of our study is to conduct a systematic review to analyze the etiological factors and assess the effectiveness of treatment based on the rehabilitative exercise, braces, electrotherapy and pharmacotherapy.

Material and methods: Has been made a search of work-related neurophysiological and biomechanical aspects, and observational studies to assess the diagnostic cross-forecasting, and clinical trials to evaluate the efficacy of therapeutic interventions. Were consulted the following databases: The Cochrane Library; PEDro - The Physiotherapy Evidence Database; MEDLINE, EMBASE, National Health and Medical Research Council, Haute Autorité de Santé and TESEO.

Results: The morphotypes disorders of the lower extremities, imbalances in the contraction of vast internal-external quadriceps, the deficits of flexibility in quadriceps, isquiotibiales and other muscle groups are predisposing factors of PFS. There is a limited evidence of the benefit of the exercise (stretching, muscle strengthening) in the PFS. The knee-foot orthoses and techniques of electrotherapy have not demonstrated a clear efficacy in the treatment of the PFS. NSAIDs may be effective in the short term.

Conclusions: The rehabilitation of PFS should assess disorders morphotypes and biomechanics. The rehabilitation program will be based on an exercise program of elasticity and strengthening muscle in open and closed chain. Orthoses and electrotherapy are used in selected patients and not so large.

Key words: Patella-femoral syndrome. Knee pain. Rehabilitation.

Rehabilitation after bone-tendon-bone plastia with faster rehabilitation protocols

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Purpose: To compare two programs of rehabilitation after ACL reconstruction through BTB plastia. The working hypothesis is to demonstrate how the faster program, which introduces cinesiterapia in opened chain more aggressive, during the first 12 weeks of rehabilitation, no presents more complications and whether better scores on the isokinetic valuations, proprioceptive computerized test and measurement functionality.

Materials and methods: Prospective study of 33 patients who follow two rehabilitation programs, 16 remain an accelerated program and 17 other classic an accelerated program more aggressive. Data was collected: age, sex, injured limb, associated injuries, acute chronic injury, mean surgery, pre-and postoperative rehabilitation sessions. We compared the evolution of the balance sheet articulate, joint effusion, pain above knee, laxitus by KT-1000, level Lysholm, isokinetic evaluation, proprioceptive assessment and EVA stability. Statistical analysis was performed using parametric methods, comparison of means for independent data.

Results: Patients who followed the protocol got better faster peak torque values in tests of isokinetic quadriceps and isquiotibiales and proprioceptive test (P>

0.05), and not in the other variables analyzed. The complications and laxity measured with KT-1000 was similar in both groups.

Conclusions: The current programs of rehabilitation allowed to be more aggressive in the first 12 weeks of rehabilitation, especially in the introduction of the cinesiterapia in closed and open chain, without increasing complications and laxity of the plastia.

Key words: ACL reconstruction. BTB plastia. Rehabilitation.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-IV

A modified quadriceps femoris muscle setting with co-contraction of the hamstrings

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Introduction: A "quadriceps femoris muscle setting" is isometric quadriceps femoris exercise which can be widely used in early knee rehabilitation. However this exercise produces minimum co-contraction of the hamstrings. The isolated contraction of the quadriceps femoris imposes maximum strain to the anterior cruciate ligament (ACL). We succeeded in developing a simple training maneuver that is effective in obtaining co-contraction of the hamstrings—a modified maneuver for the quadriceps femoris muscle setting with the contralateral lower limb raised (MQS). In this study, we analyzed the effect of this maneuver by EMG quantification, and evaluated utility in clinical practice.

Methods: Twenty-eight healthy young adult men performed sequential trials consisting of normal quadriceps femoris muscle setting (NQS) and MQS. Electromyographic activity was recorded from surface electrodes on the gluteus maximus, vastus medialis, rectus femoris, vastus lateralis, semitendinosus and biceps femoris (long head), and normalized to values derived from maximal isometric trials.

Next, eleven young adult men and women underwent ACL reconstruction performed sequential trials consisting of NQS and MQS. Electromyographic activity was recorded from surface electrodes on the vastus medialis.

Results and Conclusions: The % maximal voluntary isometric contraction (%MVIC) of the vastus medialis, vastus lateralis and rectus femoris did not vary in the each maneuver. However, the %MVIC of the hamstrings varied significantly in the MQS. This suggests that effective co-contraction of the hamstrings can be obtained in MQS by adjusting the load to the raised lower limb.

In patients underwent ACL reconstruction, the electromyographic activity of the vastus medialis was greater in MQS than in NQS. It would appear that the activity of the vastus medialis was larger in MQS than in NQS, because MQS can be performed quadriceps femoris muscle contraction without producing severe strain to ACL. Our study suggests that MQS is a useful, safe, and simple maneuver for quadriceps femoris muscle strengthening that can be performed without producing severe strain to ACL in the early stages of knee rehabilitation with ACL injury.

Key words: Quadriceps femoris muscle strengthening. Co-contraction. ACL injury.

Extracorporeal shockwaves therapy in sports medicine and orthopaedics. A case of collar bone delayed union

Español A

ICATME. Institut Universitari Dexeus. Barcelona. Clínica de Ponent. Lleida

28 years old woman rugby player.

19/10/07 left *collar bone fracture* in a rugby match. Pain, deformity of the collar bone in 1/3 medium, no paraesthesia in arm, no other vascular disorders.

Orthopaedic treatment: immobilisation by bandage in 8 during 8 week.

4 months after the accident the patient is asymptomatic, and the X-ray and Scanner show absence of consolidation. Is diagnosed as a *delayed union bone*.

14/02/2008: First session of *shockwaves* therapy, applied under local anaesthesia by Dornier ARIES type AR2 device.

POSTER COMMUNICATIONS

After the treatment immobilisation by bandage in 8 during 5 weeks. 5 weeks after the treatment still asymptomatic. X-plain after shows a good callous of consolidation.

Next control 4 months after the treatment shows the total consolidation of the bone.

Shockwaves therapy is a good treatment for pseudoarthrosis, delayed union bone, tendinitis, tendinosis, calcarea tendinitis in shoulder, bursitis, plantar fasciitis, trigger point.

Our results after 8 years applying the treatment are around 75% of successful in pseudoarthrosis and 70% in tendinitis.

Figures 1 and 2 before and after the treatment.

Key words: Shockwaves. Pseudoarthrosis-delayed union bone.



Figure 1. Español A.



Figure 2. Español A.

Is intense training physically harmful for the preadolescent?

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Introduction: Competition in youth sports has grown considerably over the last three decades and is now a major part of the world of sport. Girls and boys are undertake intense training at younger ages and compete in sports such as little league football, baseball, gymnastics, swimming, long distance running and so on. Many questions has been raised. Is intense training physically harmful for the preadolescent? It is not surprising that many musculoskeletal disorders are appearing in the skeletally immature athlete.

Objective: We tried to understand the physical capabilities of children and the potential impact that sport activity can have on young athletes. We examine growth and development. We studied he apophysis, a cartilaginous structure near the end of the bone, subjected primarily to tensile forces that are most often produced through a musculotendinous insertion. An apophysis is thus susceptible to overuse syndromes in the pediatric athlete.

Methods: We studied a group of athletes below 16 years old with apophysitis. We studied apophysitis that occur in uncommon sides of the body during specific sports. We did a medical history with information about parents, coaches, as well as the child. Recent training history, type of playing surface involved, and the presence of concurrent disease. We did a careful physical examination and we played a radiographic evaluation and other tests if necessary.

Results and discussion: Apophysitis in these areas may be seen as a result of overuse injuries, but sometimes this represents avulsions of the apophyses by the muscle tendon units which originate there. However, acute separations of the apophyses do occur with sudden contractions or stretching of the muscles that originate from or insert in those bones, while overuse injuries result from the repetitive strain placed upon tissues by the involvement in one or more specific sports and by advancing the duration and intensity of specialized training.

Conclusions: The study provides evidence that children are not merely small adults. In children the special properties of growing bones, cartilage and soft tissues can result in injuries that are different of those of the adults. We try to prevent this injuries reducing training intensity, especially during periods of rapid growth, with the supervision of all competitive sports, risk factors and etiologic causes. It is better to promote an active lifestyle early in life than spend their time watching TV, playing computer and video games.

Key words: Apophysitis. Pre adolescent. Competitive sport.

Peri-articular hyaluronic acid in acute ankle sprain: 18 months followup

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Introduction: To determine the long-term efficacy and safety of peri-articular hyaluronic acid injections in acute lateral ankle sprain, we conducted a randomized controlled prospective trial in 158 competitive athletes with grade 1 or 2 lateral ankle sprain.

Methods: Patients identified in primary sport medicine were randomized at baseline and within 48 hours of injury to peri-articular injection with hyaluronic acid (HA) + standard of care (RICE) or placebo injection (PL) + standard of care (RICE) treatment at baseline assessment and Day 4 post injury. Assessments at baseline and Days 4, 8, 30, 90 and 18 months included VAS (0-10 cm) pain on weight bearing and walking 20 m, patient global assessment of ankle injury (5-point categorical scale), patient satisfaction with treatment (5-point categorical scale), time to return to pain-free and disability-free sport, adverse events, recurrent ankle sprain and total number of days missing primary sport activity.

Results: Time to intervention was 39 ± 4 hours with no difference between groups. A significant reduction in VAS pain on both weight bearing and walking was observed at Day 8 for HA compared to PL ($p < 0.05$). There was a significant difference in VAS pain on weight bearing at 18 months favoring the HA group ($p < 0.05$). At 18 months, in the PL versus HA group, there were 2 versus 0 lower limb fractures, 16 versus 8 second ankle sprains ($p < 0.05$), 3 versus 1 third ankle sprains, and a significantly greater number of days missing primary sport activity (43 versus 21, $p < 0.002$). Time to pain-free and disability-free return to sport was $11 (\pm 8)$ vs $17 (\pm 8)$ days for HA and PL respectively ($p < 0.05$).

Conclusion: Peri-articular HA treatment for acute ankle sprain was associated with reduced pain, more rapid return to sport, fewer recurrent ankle sprains, fewer missed days from sport with few associated adverse events.

Key words: Ankle sprain. Peri-articular. Hyaluronic acid. Sport medicine.

DOPING-I

Stanozolol treatment induces structural and functional alterations in rat liver mitochondria

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Anabolic-androgenic steroids (AAS), synthetic derivatives of testosterone, exhibit a greater anabolic potency and a slower hepatic degradation than the natural hormone, and are used either clinically or in the sport context for their anabolic properties. However AAS treatment is associated with adverse effects that are generally dose related. In particular, the 17- α -alkylated AAS can provoke serious hepatic alterations. Since the physiopathological mechanisms for the AAS-induced hepatotoxicity are largely unknown, we have investigated whether a prolonged (8 weeks) oral treatment with high doses (2 mg/kg body weight; 5 days/week) of stanozolol induced mitochondrial dysfunction in rat liver. Transmission electron microscopy of hepatic tissue from treated animals revealed ultrastructural alterations of hepatocytes. The most prominent change was the presence of a fraction of swollen mitochondria with a low electron-density matrix and degraded cristae. In some instances, the outer mitochondrial membrane was disrupted and mitochondria degenerated into laminated concentric membrane arrays. Hepatic mitochondria isolated from control and treated animals exhibited similar rates of O₂ consumption and reactive oxygen species (ROS) production when respiring in the presence of complex I- or complex II-linked substrates. However, in the presence of antimycin A (full reduction of Complexes I and III, maximum rates of ROS production), mitochondrial ROS generation was lower in treated than in control rats. In liver of stanozolol-treated animals, ATP, mitochondrial Complexes I and III and apoptosis-inducing factor (AIF) levels were markedly decreased, whereas the content of the phosphorylated eukaryotic initiation factor 2 (eIF2) increased (60%). In addition, immunostaining of hepatic tissue and Western blot techniques revealed that steroid treatment resulted in a 50% reduction of the content of the cytoskeletal proteins actin and tubulin. In

conclusion, stanozolol treatment induces alterations in mitochondrial physiology, cellular ATP balance and cytoskeleton network in rat hepatocytes that may lead to liver injury. (Santander/Complutense grant PR27/05-13996).

Key words: Anabolic steroids. Mitochondrial dysfunction. Cytoskeleton.

Prevalence of drug misuse in Mexican elite athletes

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In Mexico, within the strategies of the National Antidoping Committee for the fight and prevention of drug misuse in sports, it was implemented the antidoping controls in and out of competition, mainly in elite athletes whom are susceptible of falling in this inadequate practice. The increase on the number of controls out of competition has been an initial strategy to evaluate the effectiveness of the prevention programs and the results allow to reinforce or to improve these programs in those sports in which the adverse results are high.

Objective: The purpose of this study was to evaluate the prevalence of drug misuse in Mexican elite athletes.

Methods: It was done a retrospective analysis of the analytical results arisen from antidoping controls in and out of competition events of elite athletes in the years of 2003 to 2007. The information was evaluated with descriptive statistics and analysis of frequencies by χ^2 .

Results: Within the period of study 11,475 analyses were practiced and 4.4 % through an adverse result mainly in out of competition events. Taken into account all the adverse analytical findings, 50.1% corresponds to anabolic steroids, 32.6% to stimulants, 12.3% to cannabinoids and 5% to another pharmacological group. The substances with most prevalence were nandrolone, amphetamine, cannabis and ephedrine; the sport with high incidence is base ball and within this sport it has been an important reduction of this inadequate practice in the last two years.

Conclusion: The misuse of drugs in Mexican elite athletes exists and it is most evident in professional sports like base ball. It is important to reinforce the information about the side-effects of the anabolic steroids and those considered as recreational drugs. These results are limited to elite sports and they might change when the educational programs apply to other levels inside sports.

Key words: Drug misuse. Prevalence of drugs. Antidoping control.

L'affaire Jessica Hardy – doping violations and the Olympics: ensuring qualification and competition by clean athletes

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Introduction: Athletic competition should be to perform one's best regardless of result. In an age of result-based endorsements and appearance fees, it is not surprising that doping remains a persistent problem in amateur athletics. The World Anti-Doping Agency (WADA) with World Anti-Doping Code (WADC) has been a positive force in "cleaning up" athletics. Yet, doping violations and National Olympic Committee (NOC) actions persist which betray innocent athletes. This case report addresses a complex pre-Olympic doping violation in which multiple athletes were inappropriately excluded from the Olympics.

Methods: Case analysis with literature review.

Results: At the US Olympic swimming trials for the 2008 Beijing Olympics, Jessica Hardy qualified in three events – 100m breaststroke, 50m freestyle, and 4 X 100m freestyle relay; however, she tested positive for clenbuterol, a WADC prohibited anabolic agent. Though the positive "A" sample was known prior to the nomination deadline, USA Swimming (USAS) submitted her name to the US Olympic Committee (USOC), did not substitute the next place finishers, and did not concomitantly list alternates for her events. Jessica Hardy pursued arbitration, lost, and then withdrew from the team post-deadline.

Discussion: To not be named to an Olympic team when another athlete's doping violation is known prior to the nomination deadline is unacceptable. Since positive "A" sample for anabolic agents necessitates mandatory provisional suspension (2007 WADC 4.2.2/7.5.1), the logical solution was to substitute the appropriate finishers or name them as alternates to relay pools pending results of Jessica Hardy's arbitration. USAS published selection criteria do not permit alternates (excluding relay pools) or substituting qualified swimmers not yet on

the official roster after submission to USOC. USAS selection criteria are flawed. Routine analysis of the expedited sample resulted in untimely testing that further complicated this case. Prior to the Olympics, USAS and USOC could have appealed to the International Olympic Committee (IOC) or Court of Arbitration for Sport (CAS) for post-deadline credentialing. Nothing was done. USAS and USOC did not utilize "a level playing field" for the athlete who took the prohibited substance was disqualified, but athletes who competed fairly and qualified for the Olympics were not nominated. Ethical recommendations to prevent the reoccurrence of L'Affaire Jessica Hardy include: a) naming extra athletes to all events in all sports as alternates pending results of all doping tests to ensure sufficient athletes have been nominated; b) improving speed of drug testing with maximum communication of positive results.

Conclusion: Athletes comment on the significance of being an Olympian and how this can never be taken away from you – apparently it can be and was so done by the USAS and USOC to deserving athletes.

Cardiovascular effects of chronic cocaine abuse in sportsmen

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Background: Cocaine is a sympathetic drug with well-known acute dangerous cardiovascular effects, but little is known on its chronic effect.

Methods: 17 cocaine-addicted (CASES) and 16 healthy sportsmen (CONTROLS, declaring to have never used cocaine) composed the study population. All subjects underwent a complete clinical and cardiological evaluation, including a detailed survey of volutary habits (addiction length, mean weekly dose of cocaine in the last 3 years and maximal referred assumed dose), cardiovascular symptoms, rest and stress electrocardiogram (ECG), echocardiogram (ECHO), 24-hour Holter monitoring with heart rate variability (HRV) analysis. Finally, on a venous blood sample, T troponin (TnT), and the amino-terminal fragment of brain natriuretic peptide pro-hormone (NT-pro-BNP) were detected.

Results: CASES showed more symptoms of possible cardiovascular origin than CONTROLS, reaching the statistical significance for palpitations ($p=0.03$) and thoracic pain ($p=0.03$). At ECHO, CASES showed a lower ejection fraction than controls ($57.0\pm 5.5\%$ vs $64.0\pm 5.5\%$, $p=0.001$), and early signs of diastolic dysfunction. Moreover, the presence of regional wall motion abnormalities, were observed only among CASES, like high TnT and NT-pro-BNP levels. A significant ($p<0.05$) positive correlation was found between the left ventricular mass, the interventricular septum and the posterior wall thicknesses, and the referred maximal dose of cocaine assumed. No signs of significant ventricular repolarization abnormalities and no difference in rate and kind of arrhythmias between cases and controls (during stress-ECG and Holter monitoring) were found. Finally, at HRV-analysis, cases showed a lower mean R-R interval length ($p=0.008$) and SDNN value ($p=0.003$) suggesting a higher sympathetic (or lower vagal) tone.

Conclusions: Chronic abuse of cocaine in sportsmen is linked with mild left ventricular hypertrophy, early signs of myocardial damage and higher relative sympathetic activity.

Key words: Heart. Sympathetic. Doping.

Hematological effects of chronic cocaine abuse in sportsmen

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Background: Cocaine is a sympathetic drug with well-known dangerous cardiovascular effects, but an evident lack of information exists on its effects on the blood and hematopoietic system, and on the immunological function. This study tries to bring novel insights on these topics.

POSTER COMMUNICATIONS

Methods: 17 cocaine-addicted (CASES) and 16 healthy sportsmen (CONTROLS, declaring to have never used cocaine), composed the study population. All subjects underwent a complete clinical evaluation, with particular attention to volutary habits (addiction length, mean weekly dose of cocaine in the last 3 years and maximal referred assumed dose), and a peripheral venous blood test was taken. Each blood sample was tested for the common hematological parameters and for some inflammatory markers: IL-1 β , IL-6, IL-10, IL-12p70, TNF- α , homocysteine, serum lipoprotein (a), high-sensitivity C reactive protein (hs-CRP), serum amyloid A (SAA), ceruloplasmin, retinol binding proteins (RbP).

Results: CASES showed a higher count of white cells ($p=0.005$) and neutrophils ($p=0.008$), with a significant ($p<0.05$) positive correlation with referred maximal dose of cocaine assumed during the addiction and with the referred mean weekly dose taken in the last 3 years. Moreover, CASES showed a higher count of monocytes ($p<0.0001$), eosinophils ($p=0.002$) and platelets ($p=0.0001$). No significant difference was found regarding plasma cytokines and the inflammatory markers investigated, even if a significant positive correlation ($p<0.05$) was observed between hs-CRP (and SAA), and the referred addiction length, the referred mean weekly dose of cocaine assumed in the last 3 years and the referred maximal dose taken during the addiction.

Conclusions: Present data suggest an inflammatory role of cocaine as hinted by increased levels of circulating neutrophils, monocytes and eosinophils among addicted sportsmen. The greater number of circulating platelets could also play a role in increasing the thrombotic risk among cocaine users.

Key words: Doping. Leukocytosis. Neutrophils. Platelets. Inflammation. Eosinophils.

Anabolic steroid abuse induces ergometric changes in muscle function in monozygotic twins

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Introduction: Anabolic steroids (AS) produce anabolic, androgenic and neurogenic changes in muscle tissue. The objective of this case report observational study was to detect and measure the possible ergometric changes of real-world AS use in the twin user of each pair, in comparison with his non user twin.

Methods: We studied 2 pairs of monozygotic twins: 2 healthy males 24 years old and 2 healthy males 31 years old, with absolute genome and phenotype similarity. One of the twins of each pair was using AS while the other did not. Both pairs lived in Hellenic provincial towns and followed a common high resistance training program and nutrition regime. The ergometric evaluations took place within a time interval of six months and included testing of muscle strength in 4 major muscle groups along with testing for reflexes and contraction response. All data are presented in graphs and figures for better understanding.

Results: During the study, the AS-user-twins showed a considerable increase in both muscle strength and mass. These ergometric changes were induced faster and with a higher strength value than in their counterparts. At the end of the study, there was a statistically significant increase in all ergometric values, that showed a considerable difference in favour of the AS-user-twins.

Conclusions: The results of the study suggest that the ergometric improvements in muscle function as expressed by strength of contraction and muscle mass were induced by the use of AS and are correlated to the severity of abuse.

Key words: Anabolic steroids. Ergometric changes. Doping. Muscle strength. Muscle contraction.

DOPING-II

Hypoxia: help or cheat?

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Background and objective: Intermittent hypoxia has been used as a method to improve the exercise performance. However recent publications reflect the antidoping authorities concern on the use of altitude training simulators systems. The use of recombinant human erythropoietin (rHuEPO) to enhance athletic performance is prohibited.

The *aim* of our study was to determine whether intermittent hypoxic treatments could mask the detection of rHuEPO abuse. Our hypothesis is that after the hypoxic treatments there is an increase in endogenous levels of EPO and/ or reticulocytes and haemoglobin that may camouflage the rHuEPO abuse when determined using indirect (OFF-Hr Score) or direct methods (isoelectric focusing technique).

Design and methods: Eight male young Wistar rats were treated, three times a week during two weeks, with 500 I.U. of rHuEPO-alpha. After the treatments the animals were randomly divided into two groups: one normoxic and one hypoxic. The normoxic group was maintained 24 hours at 21% O₂ during 23 days. The hypoxic group was maintained 12 hours at 21% O₂ and 12 hours at 12% O₂ (~4500 m) for the same time period.

Results: After the rHuEPO treatment, the hypoxic group of animals produced a faster recovery in the reticulocyte count, elevated levels of haemoglobin and haematocrit and a significant increase in the endogenous EPO levels when compared with the normoxic group of animals.

Interpretation and conclusions: Intermittent hypoxic treatments after rHuEPO administration can be considered a system to avoid the detection of the rHuEPO by indirect and perhaps direct methods in an animal model.

Key words: Erythropoiesis. Reticulocytes. Haematocrit.

Desmopressin induced hemodilution masks blood doping in sport. Possibility to detect its use

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Background: Blood doping improves physical performance in sport. This is the reason why the World Anti doping Agency (WADA) submit to the athletes to blood tests to determine: haematocrit, haemoglobin and reticulocytes. If the analysis shows an atypical blood value, the athlete shall be deemed unfit for competition. Plasma volume expanders (e.g. albumin, dextran, hydroxyethyl starch) are prohibited agents used to reduce haematological values after its increase using different illegal practices.

Aim: The aim of our study was to determine the role of desmopressin acetate (Minurin®) as a masking agent due to its hemodilution effect. We also wanted to test the possibility to determine its misuse with an easy although indirect method.

Methods: Venous blood samples were obtained, from eight physically active male subjects, before and 3 hours after supplementation with 0.3 mg of desmopressin acetate (DDAVP). The samples were analyzed for haematocrit, haemoglobin, reticulocytes, OFF Hr-Score, glucose, creatinine, albumin and total proteins.

Results: After treatment with DDAVP we found a significant decrease in the haematocrit, haemoglobin levels and on the OFF Hr-Score. We also found a significant decrease in glucose, creatinine, albumin and total proteins values; however, in this case, all the values were significantly below the physiological levels.

Conclusions: Treatment with DDAVP has a very effective hemodilution effect. We consider that this substance should be included in the WADA's prohibited list. The sharp decrease on the levels of the plasma parameters analysed after DDAVP administration, open up the possibility to detect the misuse of this drug by including glucose, creatinine, albumin or total proteins analysis during competitions.

Key words: Doping. Haemoglobin. Reticulocytes.

Evidence-based doping education: two dissemination models

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Introduction: ATLAS (Athletes Training & Learning to Avoid Steroids) and ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) pro-

grams are sex-specific, sport team-centered, scripted, peer-led doping-detering, harm reduction and health promotion interventions with proven efficacy (<http://www.nrepp.samhsa.gov/>). Translating evidence-based programs into community use is a challenge, and we sought to assess two dissemination models.

Methods: We compared two dissemination models: top down diffusion and end-user initiated implementation. The top down model involved partnering with the National Football League's Youth Football Fund, which sponsored program use in 8 NFL cities (40 schools; \approx 5 per NFL city). Alternatively, other schools (\approx 60) self-initiated the programs using existing funding streams, discretionary dollars or other local mechanisms. The dissemination outcomes were assessed by qualitative contact with users for descriptive information (e.g., number of teams/students completing program, acceptability and barriers), anonymous surveys of students completing the programs and information on whether the program was sustained.

Results: Data from schools, students, and coaches using the top down method and schools using end-user implementation show that although there was variability across sites, independent of dissemination type, themes emerged which inform future dissemination efforts. Based on implementation and program completion surveys, coaches from both dissemination methods found ATLAS and ATHENA implementation acceptable and feasible with reported positive effects. Primary reasons given for program implementation included the peer-led format fostered leadership skills, the content was appropriate and important, and the programs were easy to implement. Coach commitment to the program is a vital component to making the programs successful.

Conclusions: Translation and dissemination of drug prevention interventions, such as ATLAS and ATHENA, can be effective with both a top down and school initiated purchase. Lessons learned from both models contribute to an understanding of effective means to move science to service to improve the health of adolescent athletes.

Key words: Doping prevention. Health promotion. School athletes.

Contemporary patterns of anabolic steroids abuse and associated side effects in athletes

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Introduction: Anabolic steroids (AS) abuse by athletes has intensified to the point that every year, a number of top athletes are being banned from competition due to positive doping control tests. Most discouraging, is the fact that sport's fans and recreational athletes are using AS more frequently than ever, in an effort to improve their physique and performance. The objective of this study was: 1. verification of biostatistic and demographic parameters of AS users, 2. categorization, recognition and evaluation of AS used.

Methods: Generalized questionnaires were used to identify and stratify users. 6500 questionnaires were given out in health clubs, gymnasiums and sport's centres in Athens and Thessaloniki. In Athens, out of 3500 questionnaires, 2896 (82.7%) were filled, 2190 (75.6%) by recreational and amateur athletes and 706 (24.4%) by professionals. In Thessaloniki 2178 (72.6%) questionnaires were filled, 1956 (89.7%) by recreational and amateur athletes and 222 (10.3%) by professionals. The data provided from questionnaire evaluation were categorized and elaborated.

Results: As AS users were identified: 49% of Athens professionals, 66% of Athens amateurs and recreational athletes, 63% of Thessalonica's professionals and 64% of Thessalonica's amateurs. Further elaboration of the results had four directions: 1. separation of users according to sex and athletic category, 2. stratification of users according to severity of AS abuse, 3. presentation of AS regimens (AS, types and doses) used by the cohort, 4. acute results of AS abuse to the users' organism as well as long term influence in a three years time interval. All results are presented in statistical tables and charts for better understanding.

Conclusions: Modern type of AS abuse has become more prevalent and circumspect. Contemporary AS users consistently practice overdose polypharmacy showing no regard to the detrimental effects these agents may have on health.

Key words: Anabolic steroids. Side effects. Doping. Patterns.

Anabolic steroids use in monozygotic twins relates to psychiatric and hostility factors

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Introduction: Anabolic steroids (AS) are derived by chemical manipulation of the testosterone molecule. The specified category of drugs produces anabolic, androgenic and psycho-active effects, including elevated aggressive, hostile, violent and anti social behavior. The objective of this case report observational study was to detect and evaluate the possible psychological consequences of real-world AS use in the twin user of each pair, in comparison with his non user twin.

Methods: We studied 2 pairs of monozygotic twins: 2 healthy males 24 years old and 2 healthy males 31 years old, with absolute genome and phenotype similarity. One of the twins of each pair was using AS while the other did not. Both pairs lived in Hellenic provincial towns and followed a common training and nutrition regime. The psychometric instruments used were the Symptoms Check List – 90 (SCL-90) and the Hostility and Direction of hostility Questionnaire (HDHQ). The psychometric evaluations took place within a time interval of six months.

Results: At the end of the study, high levels of aggressiveness, hostility, anxiety and paranoid ideation were reported from the twin users. The non-user twins showed no deviation from their initial status.

Conclusions: The results of the study suggest that the modern type of AAS use, self applied by the user twins, induced several important psychiatric changes non existent in the non user twins.

Key words: Anabolic steroids. Psychiatric side effects. Doping. Severity.

Subtle differences between anabolic steroid use patterns of recreational and professional athletes

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Introduction: Anabolic steroids (AS) abuse is a growing problem for the athletic community. Every year, the incidents of top athletes testing positive in doping control tests are increasing. Sport's fans and recreational athletes are also using AS more frequently than ever. The objective of this study was the study of possible differences between AS regimes of athletes and those self applied by sport's fans.

Methods: Questionnaires were used to identify and stratify AS users. 6500 questionnaires were given out in health clubs, gymnasiums and sport's centres in Athens and Thessaloniki. In Athens, out of 3500 questionnaires, 2896 (82.7%) were filled, 2190 (75.6%) by recreational and amateur athletes and 706 (24.4%) by professionals. In Thessaloniki 2178 (72.6%) questionnaires were filled, 1956 (89.7%) by recreational and amateur athletes and 222 (10.3%) by professionals. The data provided from questionnaire evaluation were categorized and elaborated. As AS users were identified: 49% of Athens professionals, 66% of Athens amateurs and recreational athletes, 63% of Thessalonica's professionals and 64% of Thessalonica's amateurs. All users were interviewed and their regimens categorized.

Results: All regimens were cross referenced for similarities and/or differences and were stratified according to the severity of abuse and according their users' status (professional or recreational athletes). Presentation of AS regimens (AS, types and doses) used by the cohort is tabulated. All results are presented in statistical tables and charts for better understanding. Further elaboration of the results delineates the differences between professional and amateur regimens.

Conclusions: Non-professional AS users consistently practice overdose polypharmacy, using long lasting agents in contrast to the more selective use of the professionals who use designer AS and AS with shorter half life that are difficult to detect on doping control tests.

Key words: Anabolic steroids. Regimen. Doping. Severity. Athletes.

EXERCISE PHYSIOLOGY-I

Stanozolol treatment decreases the oxidative damage induced by exhaustive exercise on muscle mitochondria

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POSTER COMMUNICATIONS

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Anabolic-androgenic steroids (AAS) are used in the sport context to improve physical performance. In addition to the well-known effects on muscle mass and strength, AAS have been shown to increase work capacity and fatigue resistance of skeletal muscles, but the molecular basis for these effects remains uncertain. Muscle fatigue has been related to oxidative damage caused by an increased generation of reactive oxygen species (ROS) in exercising muscles. The main source and target for ROS under these conditions are mitochondria. Therefore, we have investigated the effect of a treatment with the AAS stanozolol (8 weeks; 5 days/week; 2 mg/kg body weight) on the extent of oxidative damage induced on rat muscle mitochondria by a single session of treadmill running. In control rats, the exercise session increased mitochondrial levels of highly specific markers of protein oxidation (the protein carbonyls glutamic and amino adipic semialdehydes, GSA and AASA), glycooxidation (carboxyethyl-lisine, CEL) and lipoxidation (carboxymethyl-lisine and malondialdehyde-lisine, CML and MDAL). Stanozolol treatment markedly reduced the extent of oxidative damage to mitochondrial proteins induced by exercise. This effect was not due to an enhancement of antioxidant defences since mitochondrial superoxide dismutase and glutathione peroxidase activities were not modified in stanozolol-treated rats. The running session did not change the rate of mitochondrial O₂ consumption in the presence of complex I- or complex II-linked substrates. However, the rate of ROS generation by respiring mitochondria increased in control rats whereas remained unchanged in the steroid-treated animals. These differences were not detected when mitochondrial ROS production was measured in the presence of inhibitors of the respiratory chain (rotenone or antimycin A). We conclude that stanozolol treatment prevents the exercise-induced mitochondrial ROS overproduction, increases the efficiency of the respiratory chain and reduces mitochondrial oxidative damage. These effects could contribute to increase fatigue resistance of skeletal muscles (Supported by M.E.C. n° BFU2005-08506-C02-02).

Key words: Anabolic steroids. Protein oxidative damage. Mitochondrial ROS production.

Influence of training status on the exercise-induced free radical production by muscle mitochondria

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Endurance exercise causes a marked increase in oxygen consumption and an augmented generation of reactive oxygen species (ROS) in the working muscle. ROS are involved in the mechanisms of adaptive response of skeletal muscle to exercise through modulation of gene expression, and play also a causal role in muscle fatigue. The sites of ROS production during exercise are controversial and several potential sources have been proposed. We have investigated in rat skeletal muscle the effects of 12-weeks endurance training and/or a single session of exercise (treadmill running, 50-60 min) on: i) mitochondrial ROS production and scavenging; ii) xanthine oxidase activity; and iii) oxidative stress status. Neither training nor exercise session modified mitochondrial O₂ consumption in the presence of complex I- (pyruvate/malate) or complex II- (succinate) linked substrates. However, the rate of H₂O₂ release by respiring mitochondria (with these substrates, and both in state 4 and state 3) increased in sedentary rats after the running session and decreased in trained rats at rest. Interestingly, the single session of exercise did not modify mitochondrial ROS production in the trained animals. Mitochondrial antioxidant enzymes resulted differently affected by acute and chronic exercise: the running session increased superoxide dismutase (Mn-SOD) activity whereas training augmented glutathione peroxidase activity. Xanthine oxidase activity, a potential source of ROS, was not modified by the exercise protocols. Determination of TBARS, cardiolipin and protein thiol levels, and aconitase activity revealed that the exercise session, but not the training programme, provoked oxidative damage to mitochondria. Both acute and chronic exercise increased muscle content of the stress protein HSP72. We conclude that mitochondria are involved in the exercise-linked ROS production in muscle and constitute a target for oxidative damage. The type of contractile activity (acute vs chronic) modulates the capacity of mitochondria for ROS production and scavenging (Supported by M.E.C. n° BFU2005-08506-C02-02).

Key words: Mitochondrial ROS production. Xanthine oxidase. Oxidative stress.

A new diagnostic method for the evaluation of chronic fatigue syndrome?

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Background: Chronic fatigue syndrome (CFS) is a disabling illness of unknown aetiology that is characterized by fatigue associated with a reduced ability to work; it lasts for more than six months and is accompanied by a set of symptoms. The diagnosis of CFS remains difficult due to the absence of any laboratory test, and it is therefore made largely on the basis of the symptoms reported by the patient. The aim of this study was to analyse differences between CFS patients and a matched control group as regards blood nitrate levels after a physical exercise test.

Methods: Thirty-seven consecutive female patients with CFS and fifteen healthy women performed an exercise test using a cycle ergometer accompanied by monitoring of cardiopulmonary response. Blood samples were obtained for biochemical analyses (glucose, lactate and nitrates) at the beginning (under resting conditions) and after the maximal and supramaximal tests.

Findings: Plasma nitrates differed between the groups, with higher values in the CFS group ($F=3.89$, $p<0.05$). Nitrate concentration increased in relation to workload and reached higher values in the CFS group, the maximum difference with respect to the control group being 410% ($t=5.146$, $p<0.001$).

Interpretation: The main result of the present study is that NO metabolites (nitrates) showed a much higher increase after a maximal physical test in CFS patients than in a group of matched subjects. This combination (exercise plus NO response evaluation) may be useful in CFS diagnosis.

Key words: Chronic fatigue syndrome. Exercise. Nitric oxide.

The effect of caffeine ingestion on natural killer lymphocyte activation following prolonged strenuous cycling

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Introduction: Caffeine is consumed by many athletes for its known ergogenic properties. However despite the high intention by athletes to use caffeine (Chester & Wojek, 2008, *Int. J. Sports Med.* 29:524-528), little research has concentrated on its effects on human immune function following high intensity exercise. Caffeine could affect immune cell function due to its actions as an adenosine receptor antagonist and on catecholamine release. Therefore this study investigated the effect of caffeine ingestion on Natural Killer (NK) lymphocyte function following prolonged, strenuous cycling in response to antigen stimulation, as assessed by the early activation molecule CD69.

Methods: Following an overnight fast and 60 h abstinence from caffeine containing foods and beverages, 6 healthy male endurance trained cyclists (age: 22 ± 2 years, $V\dot{O}_{2\max}$: 62.5 ± 3.3 ml.kg⁻¹.min⁻¹, mean \pm SD) cycled for 90 min at 70% $V\dot{O}_{2\max}$ 60 min after ingesting 6 mg.kg⁻¹ body mass of either caffeine (CAF) or placebo (PLA). During the trials, subjects consumed 2 ml.kg⁻¹ body mass of water at 15 min intervals and a further 5 ml.kg⁻¹ body mass 5 min post-exercise. Venous blood samples were obtained before supplementation, pre-exercise, immediately post-exercise and 1 h post-exercise. The trials were performed at least 7 days apart in a randomised design. NK cells were stimulated with the PediaCell (5 in 1) vaccine at a dose of 1:4000 and 1:8000 (optimum and sub-optimum, respectively).

Results: The percentage of stimulated NK lymphocytes was significantly higher on CAF than PLA at pre and 1 h post-exercise ($P<0.05$). The CD69 geometric mean fluorescence intensity (GMFI; density of expression) on stimulated NK lymphocytes was also significantly higher on CAF than PLA at 1 h post-exercise ($P<0.05$), with PLA only showing a significantly lower GMFI at post and 1 h post-exercise than at pre-supplement ($P<0.05$).

Conclusions: These findings suggest that caffeine ingestion enhances the antigen stimulated CD69 expression on NK cells 1 h after high intensity prolonged cycling. As NK lymphocytes represent a major first line of defence against viral infection, an increase in antigen stimulated CD69 expression 1 h post-exercise as a result of caffeine ingestion may relate to an enhanced host defence.

Key words: Natural Killer cells. Caffeine. CD69. Physical exercise.

Attempt to measure motor unit activity during dynamic muscular contraction using independent component analysis

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Introduction: Motor unit action potential (MUAP) has been measured for neuromuscular researches and clinical applications mostly in static contraction. We developed a technique to measure the MUAP in dynamic contraction. We used flexible micro-wire electrode to minimize the invasiveness and the restraint which were problems of conventional techniques. The micro-wire electrode generally collects more MUAP's than the concentric needle electrode commonly used. The independent component analysis (ICA) technique was applied to separate individual MUAP's.

Modified ICA: EMS's were recorded using four micro-wire electrodes. The conventional ICA technique was not effective to separate the MUAP's from these EMG's. We have newly developed a modified ICA technique to make it more effective. In this modification, the measured EMG's are separated in the signals with different frequency bands using band-pass filters. The effect of interference between EMG signals is roughly suppressed by this process. The ICA technique is applied to these frequency-separated EMG signals to extract a major MUAP. The MUAP is subtracted from the EMG signals and the ICA is applied to the residual signals to extract the second major MUAP. This process is repeated as long as meaningful MUAP's can be extracted.

Results: Effectiveness of the proposed technique was examined in numerical simulation. Figure 1 shows the dependence of extracted MUAP numbers on the number of firing MUAP's. With a monopolar wire electrode, the extraction of MUAP was not easy particularly when the number of firing MUAP's increases. With a concentric needle electrode, the number of extracted MUAP's become more than that of the monopolar wire electrode. However, the improvement was not large. With a bipolar wire electrode, we can expect similar improvement if the potential-leading area is made narrow. By applying the ICA technique, the number of extracted MUAP's was apparently increased. With the proposed

technique, significant improvement in the number of extracted MUAP's was confirmed.

Key words: EMG. Motor unit. Independent component analysis. Dynamic contraction.

EXERCISE PHYSIOLOGY-II

The evaluation of local muscle fatigue at athletes by surface electromyography

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Introduction: At the current moment, the researches related to the electrical phenomenon in the muscle contraction are useful especially in surface electromyography (EMGS) because the methods are more simple and the EMGS unit cannot make a difference between motor units potentials during maximal muscle contraction.

Method: In our research regarding muscular performance, we have chosen the usage of EMGS correlated with the simultaneous recording of the developed muscle force, by myomechanography (MMG), with the purpose of finding a synthetically relation between the muscle force and the EMGS parameters. For this we have used modern methods of computerized processing of the EMGS recordings, methods which are used frequently only by the high rank researches, and ours new methods, resulting original parameters and indices for better analysis of muscle contraction.

Results and conclusions: We obtained a number of 46 electrophysiological, mechanographic, cardiovascular parameters and 7 synthetic indices derived from primary parameters. Comparing various sportive branches, there were significant differences for the majority of parameters and especially for the synthetic indices as exhausting percent threshold (PET), effort resistance index – mechanical energy dependent (IREM = PET x Integrated force), the Duration/PET ratio, Integrated force/PET ratio and the parallelism between athletes and non-athletes, between lots based on age groups, between healthy subjects and subjects with neurological pathology. We also showed that muscular fatigue install at higher values of physical effort when the durations of repetitive contraction are shorter (in every cycle of repetitive activity the contraction was 40% and the resting time was 60%).

Key words: Surface electromyography. Mecanography. Athletes.

Heart rate and maximal oxygen uptake at ventilatory threshold and maximal effort in trained duathletes

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The duathlon is a 3-event endurance sport in which athletes compete sequentially running, cycling and running. Exercise training-induced physiological adaptations in virtually all systems of the body allow the athlete to accomplish this. Aerobic capacity (measured as maximal oxygen uptake, VO₂max), economy of motion (submaximal VO₂) and fractional utilisation of maximal capacity (%VO₂max) reflect the integrated responses of these physiological adaptations.

Purpose: The aim of this study was to compare the physiological responses in maximal cycling (CE) and running (TR) laboratory test of trained short-distance duathletes. Other objectives were: compare physiological variables (Heart Rate, VO₂, VCO₂, RER and VE) in aerobic threshold (VT1), anaerobic threshold (VT2) and maximal effort (VO₂ peak).

Methods: VO₂max, heart rate (HR) was evaluated at ventilatory thresholds (VT1 and VT2) and measured during incremental CE (onset at 60 watts and increase of 30 watts/min until exhaustion) and TR (onset at 8 km/h and increase of 1 km/h/min until exhaustion) test in a group of 10 highly trained (competition phase) male duathletes [mean ± SD, age: 25.8 ± 7.8 years, weight: 67.12 ± 8.1, height: 174.4 ± 6.8 cm, fat mass: 8.70 ± 1.31%.(Whiters eq), VO₂max : 63.3 ± 8.3 ml.kg⁻¹.min⁻¹]. VT1 and VT2 were assessed by changes in VO₂, VCO₂ equivalent and PetO₂, PetCO₂ (Skinner-MacLellan) using a breath-by-breath automated system (CPX, Medical Graphics, Minnesota, USA). Statistical analysis: Comparison of means between protocols were performed by paired Student's t-test and significance was set at p<0.05.

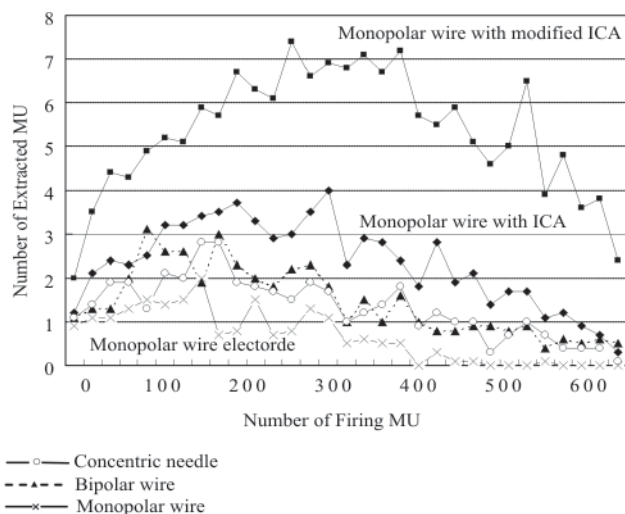


Figure 1. Miwa K. et al. Number of measured MU by different method applied.

Results: Duathletes achieved a significantly higher $\dot{V}O_{2\max}$ in CE ($4.72 \pm 0.75 \text{ l}\cdot\text{min}^{-1}$) than for TR ($4.18 \pm 0.61 \text{ l}\cdot\text{min}^{-1}$) ($p=0.01$), and RER_{\max} , RER_{VT1} and RER_{VT2} . No exist differences between CE and TR in $\text{VO}_{2\max}$ (63.3 ± 8.3 vs $59.2 \pm 6.1 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$), $\text{VO}_{2\text{VT1}}$ (38.3 ± 3.97 vs 38.8 ± 4.3) and $\text{VO}_{2\text{VT2}}$ (50.1 ± 6.5 vs 46.9 ± 5.9) (all $p>0.05$). Exist differences between CE and TR in HR_{\max} (177.8 ± 12.1 vs $186.4 \pm 8.4 \text{ b}\cdot\text{min}^{-1}$) ($p<0.005$) and $\text{VO}_{2\text{VT2}}$ (162.1 ± 13.3 vs 167.3 ± 10.0) ($p=0.01$). Respiratory exchange ratio (RER) was consistently higher in CE than TR ($p=0.01$) and no differences are present between CE and TR in $\text{VO}_{2\max}/\text{VO}_{2\text{VT1}}$ ($p=0.20$), $\text{VO}_{2\max}/\text{VO}_{2\text{VT2}}$ ($p=0.24$), $\text{HR}_{\max}/\text{HR}_{\text{VT1}}$ ($p=0.06$) and $\text{HR}_{\max}/\text{HR}_{\text{VT2}}$ ratios ($p=0.06$).

Conclusions: The results suggest that percent HR and $\dot{V}O_2$ in trained duathletes are similar in relation to VT1, VT2 and Max intensity points. Probably absolute differences (HR, RER, VE, $\dot{V}O_2$) are in relation of effort position and training seasonal loads.

Key words: Duathlon. Heart Rate. Oxygen uptake.

Evolution of simple and elective reaction time in motorcycle bikers during 24 hours endurance race

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Reaction Time (RT) is a putative biomarker of central fatigue in athletes during prolonged efforts. The aim of this study was analyzed the evolution of simple RT (RTS) and elective RT (RTE) in bikers during 24 hours (12 o'clock to 12 of the next day) changeover motorcycle race.

Prior to competition, 10 males bikers (28 ± 6 years) of different teams yielded arm RTS test (Musclelab Reaction Time[®]) and leg RTE test (TKK 1264) in basal conditions. During the race, the same bikers carried out the reactions test between 10 minutes after each changeover. Ergogenic aids as caffeine, ginseng, taurine or guarana were control during all competition. Also lactate concentration was measured (LactatePro, Germany) before reaction test.

Non significant results were found in arm RTS: 0.249 ± 0.23 ms, 0.243 ± 0.31 ms, 0.240 ± 0.29 ms and 0.237 ± 0.41 ms between the first, second, third and four changeover respectively. Values of for leg RTE stimulus are in table 1. Mean values \pm SD for lactate concentration was $2.8 \text{ mmol}\cdot\text{L}^{-1}$ (Table 1).

Table 1. Porta J, et al. Mean \pm SD RTE stimulus

Stimulus	Basal	1 st Changeover	2 nd Changeover	3 rd Changeover	4 th Changeover
Forward	0.494 ± 0.91	0.560 ± 0.84	0.559 ± 0.76	0.580 ± 1.00	0.504 ± 0.88
Back	0.632 ± 1.01	0.705 ± 0.92	0.695 ± 0.64	0.693 ± 0.85	0.632 ± 0.93
Left	0.532 ± 0.80	0.587 ± 0.73	0.565 ± 0.82	0.535 ± 0.79	0.533 ± 1.04
Right	0.562 ± 0.78	0.612 ± 0.98	0.587 ± 0.86	0.565 ± 0.84	0.511 ± 0.99

In spite of these results, this study showed that the tendency in TRS was to improve values of two tests during the race, but TRE remained stabled during all competition. Adrenergic stimulation is suggested that can affect activation of the bikers as illustrated another investigations in different athletes. We our results showed that limiting physical factors with the performance of bikers was not relationship to RT and central fatigue. Future studies need to be addressed for revealing adrenergic mechanism during motorcycle race.

Key words: Fatigue. Perceptive-motor perception.

Analysis of the physiological parameters and success of stroke during a tennis specific field test

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The aerobic and anaerobic endurance is a factor of tennis performance. There is a deficit of specific field tests for tennis that can provide complementary information to the laboratory test; therefore it is necessary to investigate on new field test that allows to relate the physiological parameters with the technical ones, for a better objective control of the tennis performance.

Aim: The aim of this preliminary study was to analyze the behaviour of the workload and physiological parameters tied to the same one on the success or efficiency of stroke (ES), obtained during a field tennis test.

Methods: The study was realized by 5 tennis players (age 23 ± 1.9 years; height 174.9 ± 5.7 cm; weight 68.1 ± 5.7 kg; training per week 8.2 ± 2 hours). All subjects performed two incremental protocols to exhaustion: laboratory test (treadmill test) and a tennis specific field test. The field test consisted of repeated strokes (forehand and backhand) during 1 min, with 20 sec of rest. In both tests, heart rate (HR) and rating of perceived exertion (RPE) was monitored; the ventilatory thresholds were determined in the laboratory test.

Results: High positive correlation was found between intensity, HR and RPE ($p < 0.001$), while the correlation between it and ES was highly significant ($p < 0.01$) and negative.

Conclusion: We think that there is an inversely proportional relation between the ES with the HR and the RPE. The profile of efficiency of stroke for the subjects is related to the metabolic zones: maximum ES is in aerobic zone (VT1) and minim ES is located in maximum intensity of the test.

Keys words: Field test. Tennis performance, Success of stroke.

Chronic loading increases the number of leptin receptors in the human triceps brachialis: a study on professional tennis players

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Leptin plays a crucial role in the regulation of appetite, body fat mass and basal metabolic rate. We have recently shown the presence of OB-R long and short protein isoforms (OB-R170, OB-R128 and OB-R98) in human skeletal muscle. Human obesity is characterised by a high concentration of leptin in plasma associated with leptin resistance. Leptin may also down-regulate leptin signalling in muscle by inducing the protein suppressor of cytokine signalling 3 (SOCS3). Recent evidence suggest that exercise restored the ability of leptin to increase the muscular fatty acid oxidation in obese rats without any change in the SOCS3 mRNA. However, there is no data about the effects of exercise on muscle leptin sensitivity in humans. Tennis is an excellent model to study muscle plasticity, since tennis players submit their dominant-arm to a huge amount of physical activity compared to their contralateral arm.

Methods: Nine professional tennis players (24 ± 2 years, 185 ± 8 cm, and 78 ± 10 Kg of body mass) underwent a body composition examination with a dual-x ray absorptiometer and three muscle biopsies one from the vastus lateralis and one from each triceps brachialis (short head). The muscle samples were processed for assessment of the leptin receptor protein isoforms, and SOCS3 protein expression by Western Blot.

Results: The dominant arm had 14.2% higher muscle mass ($P < 0.05$) and 62% greater OB-R170 protein expression ($P < 0.05$) than the contralateral arm. Adipose tissue contamination in the triceps muscle biopsies can not explain the observed difference in OB-R170 amount between arms, as the perilipin A protein content was similar in both arms ($P=0.4$). Moreover, the amount of SOCS3 was similar in both arms ($P=0.52$). In the dominant arm there was an inverse correlation between OB_R170 protein expression and SOCS3 protein content ($r=-0.67$, $P < 0.05$). However in the non-dominant arm there was no correlation between these variables ($r=0.29$, $P=0.5$).

Conclusions: Skeletal muscle leptin receptors are up-regulated in the triceps brachialis in response to chronic loading. The latter combined with the fact that SOCS3 protein expression was not increased indicates that chronic loading may result in increased leptin sensitivity in human skeletal muscle.

This study was supported by grants from the Ministerio de Educación y Ciencia (BF12003-09638, BFU2006-13784 and FEDER), Gobierno de Canarias (PI2005/177) and Universidad de Las Palmas de Gran Canaria, Spain (UNI2006/05).

EXERCISE PHYSIOLOGY-III

Impact of a soccer match on oxidative stress and muscle damage in elite female players

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Introduction: Most research studies on the biochemical and physiological changes during a football match have been performed in male players¹. To date, no studies have reported the impact of a soccer match on oxidative stress and muscle damage in women. The aim of this study was to analyse the effect of a competitive soccer match on the plasma levels of oxidative stress and muscle damage markers in elite female players of different ages.

Methods: 14 female soccer players of the Athletic Club of Bilbao playing in the Superliga participated in this study (mean age 25 ± 5.1). Blood samples were obtained 24h before, immediately after and 18h after the match. Serum levels of Total Antioxidant Status (TAS), Superoxide Dismutase (SOD), Glutathione Reductase (GR), Glutathione Peroxidase (GPx), uric acid (UA), Albumin (Alb), Creatine Kinase (CK), Aspartate Aminotransferase, Alanine Aminotransferase, γ -glutamyl transpeptidase and Lactate Dehydrogenase (LDH) were measured. ANOVA and Scheffé post-hoc test were used for the statistical analysis.

Results: Following the match TAS ($p=0.01$), UA ($p<0.01$) and Alb ($p<0.001$) increased and recovered after.

CK levels increased until 18h after the match ($p<0.05$). And LDH increased but then decreased to the baseline 18 hours later ($p<0.001$) (Table 1).

Table 1. Gravina L, et al.

	24h pre-match	post-match	18h post-match	ANOVA
TAS	0.757 ± 0.05 ^a	0.859 ± 0.10 ^b	0.739 ± 0.07	0.001
UA	3.55 ± 0.39 ^a	4.39 ± 0.90 ^b	3.68 ± 0.61	0.006
Alb	4.52 ± 0.18 ^{aa}	4.99 ± 0.17 ^{bbb}	4.57 ± 0.17	0.000
CK	123.69 ± 49.4 ^c	208.38 ± 92.4	277.92 ± 224.2	0.032
LDH	306.77 ± 23.95 ^{aa}	389.69 ± 39.92 ^{bb}	336.46 ± 32.36	0.000

^apre-match vs post-match, $p<0.05$; ^{aa}pre-match vs post-match, $p<0.001$; ^bpost-match vs 18h post-match, $p<0.05$; ^{bb}post-match vs 18h post-match, $p<0.01$; ^{bbb}post-match vs 18h post-match, $p<0.001$; ^cpre-match vs 18h post-match, $p<0.05$

Conclusions: A soccer match has an influence in some parameters related to oxidative stress and muscle damage in women. There is a clear mechanism of defence from free radicals formed after the match, shown by the increase in antioxidant capacity and antioxidant enzymes.

Also, muscle damage has been observed in women soccer players which is not totally recovered after 18 h post-soccer match.

References:

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Key words: Female soccer. Oxidative stress. Muscle damage.

Better antioxidant capacity in elite female soccer players compared to sub-elite players

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Introduction: Oxidative stress has been the subject of study of many research projects for the last years. Most of the studies have reported the presence of oxi-

dativ stress as a consequence of intense physical activity in some sports¹, such as soccer. However, no studies have shown whether a higher level of playing or training intensity may improve the antioxidant defence mechanism against oxidative stress. Thus, the purpose of the study was to determine the antioxidant capacity in elite and sub-elite women soccer players during a soccer match.

Methods: 28 female soccer players from the Athletic Club of Bilbao participated in this study: team A (playing in the Superliga, mean age 25 ± 5.1, n=14) and team B (playing Northern League, mean age 18 ± 1.7, n=14). Blood samples were obtained 24h before, immediately after and 18h after a competition match. Serum levels of Total Antioxidant Status (TAS), Superoxide Dismutase (SOD), Glutathione Reductase (GR), Glutathione Peroxidase (GPx), Bilirubin, Albumin (Alb), Ferritine, and Uric Acid (UA) were measured. Student-t test for independent samples was used for the statistical analysis.

Results: At rest TAS and GPx activity were significantly higher in team A compared to team B ($p<0.001$). This difference was maintained immediately after and 18h after the soccer match. Team A also had SOD activity higher immediately after a match ($p<0.05$) and 18h post-match ($p<0.01$). Team B, however, presented a higher GR activity 18h post-match ($p<0.05$). No significant differences were observed in the rest of the parameters.

Conclusions: The elite team had better antioxidant capacity than the sub-elite team, particularly, after playing a match. It is possible that training at higher intensity and level produces a better and/or faster defensive response to oxidative stress.

References:

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Key words: Elite level. Antioxidant capacity. Female soccer.

Acute effects induced by rotational and vertical mechanical vibrations on balance, strength and electromyography activity

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Introduction: The effects of whole-body vibration (WBV) exercise on lower extremity strength, balance, and electromyography activity have been product of research. An improvement in balance has been reported after WBV exercise. In addition, isometric knee extensor strength (MVC) has been shown to improve with WBV exercise. However other authors found no significant effects on MVC. Although two types of vibrations are used (rotational (R) (v.g. Galileo® and vertical (V) Powerplate®), very few studies have been carried out to assess differences between them. Therefore, the purpose of this study was to compare the acute effects of R-WBV versus V-WBV on MVC, balance and electromyography activity (EMG).

Methods: 44 Exercise Science students were divided into two groups to counterbalance trainings. Subjects performed two training sessions, one for each vibration type. Each session comprised: 30 s Romberg (eyes open) balance test, followed by 5 min of vibrations, V or R (1 min on & 1 min out of the platform). Balance was measured by force plate and EMG was recorded EMG device. Then, another 30 s balance test was recorded, followed by a MVC.

Results: Independently of vibration type, a significant increase of 27,3% and 6,9% was observed for EMG signal amplitude of the gastronemius and vastus medialis respectively from minutes 2 to 4 of the training. For the vastus lateralis, a significant increase of frequency (3,5%) and amplitude (13,3%) was also observed. MVC remained the same after training with any vibration type, but there was a significantly greater effort perception with R-WBV. Out of all stability parameters recorded, a significant increase of total displacement (33,1%), mean velocity (17,2%), maximal medial/lateral (ML) and anterior/posterior (AP) forces (11,4% and 26,8% respectively) was observed independently from vibration type. In addition, after session with R-WBV, area of overall centre of pressure displacement was 22,5% larger compared to V WBV. Also, a significant increase of dispersion (14,7%), displacement (11,2%) and maximal force (18,4%) in the ML axis was found after R WBV training.

Conclusions: Although no increase in MVC was observed after session with R/V-WBV, subjects perceived a greater effort with R-WBV training. In addition, after 4 minutes WBV training, a significant increase in EMG activity was observed on the gastronemius, vastus medialis and vastus lateralis muscles. After

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session with R-WBV, balance is negatively altered primarily in the ML axis, and affects overall postural stability. All this should be taken into account, for it might be negative towards incoming activities after WBV training. Key words: whole-body vibration, balance, vibration type.

Influence of moderate / intense and prolonged physical exercise on crystalluria and on some modulators of urinary stone formation

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Introduction: The pathogenesis of nephrolithiasis is multifactorial. The urine solubility can be seriously altered by several factors. One of the most important of them is the existence of an imbalance between the urinary concentrations of lithogenic promoting and inhibiting factors. On the other hand, the hard and prolonged physical exercise has been classically considered as a factor which can induce kidney stones formation. That is due to the characteristics of the urine formed then: scarce, concentrated, and acid. The changes induced by this kind of physical exercise on the urine volume, pH, and osmolality are well-known; however, the exercise-induced changes on the others important nephrolithogenic promoters and inhibitors aren't.

Objectives: To advance in the research of the physical exercise as a risk factor of nephrolithiasis through the study of the changes induced on crystalluria and on some of the most important nephrolithogenic promoters (pH, density, oxalate, calcium, phosphate, uric acid) and inhibitors (citrate, magnesium, zinc), by a moderate / intense and prolonged physical exercise.

Material and methods: Thirty nine healthy trained males (age: 40,8 ± 11,9), without personal nephrolithiasis backgrounds, cycled at their ventilatory threshold 2 (VT₂) intensity for 90 minutes. During exercise the mineral water intake was free and each subject drank "ad libitum". Before (1) and immediately after exercising (2) subjects were weighed and a sample of their urine was collected to determinate by laboratory standard techniques: pH, density, oxalate, calcium, phosphate, uric acid, citrate, magnesium, zinc, creatinine, and crystalluria. Dates are expressed as means (X) ± standard deviation (SD). Significant changes have been set at P:<0,05 using a T-Student test.

Results: They have shown significant increases (*) in the urinary concentrations of: oxalate, phosphate, and creatinine; and significant decreases (**) in: weigh (<2%), pH, and calcium. There haven't been significant changes in: density, uric acid, citrate, magnesium, zinc, and crystalluria. These results are shown in the charts (Table 1).

Table 1. Arasa M, et al.

	Weight**	pH**	Density	Oxalate*	Calcium**	Phosphate*
1	74.6±9.4	6.5±0.9	1012±5	1.5±1.3	8.6±7.1	34.8±23.9
2	73.4±9.5	5.9±0.8	1013±6	2.2±1.3	5.7±5.5	51.7±32.1
	Uric acid	Citrate	Magnesium	Zinc	Creatinine*	Cristal
1	32.9±18.9	44.1±42.3	4.5±3.1	21.7±16.6	74.7±50.4	0
2	29.0±14.8	47.1±33.4	3.2±2.5	26.5±26.4	105.7±60.7	0

Before and after exercising the all values of parameters studied have remained within the range of normality.

Conclusions: When the grade of dehydration is less than 2%, a moderate / intense and prolonged bout of physical exercise neither increases crystalluria nor induces important imbalances between the urinary concentrations of promoters and inhibitors of nephrolithiasis.

Key words: Exercise. Nephrolithiasis. Crystalluria.

Gender differences in the exercise response after sildenafil administration at simulated altitude

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We examined the effects of sildenafil, a 5-phosphodiesterase inhibitor, in humans during exposure to hypobaric hypoxia at rest and after exercise. We measured cardiovascular parameters such as systemic arterial pressure (SAP), heart rate (HR), arterial oxygen saturation (SaO₂); and respiratory parameters such as respiratory frequency and tidal and minute expired volume. The time to reach the respiratory anaerobic threshold (RAT) was also recorded. The protocol was developed following a double-blind study: 100 mg placebo or sildenafil was administered orally to 24 healthy volunteers (11 men and 13 women) 30 minutes before exposure to 4,000 m of simulated altitude. Cardiovascular and respiratory parameters were measured at rest in normoxia, at rest in hypoxia and after exercise in hypoxia.

As expected, the combined action of hypobaric hypoxia and exercise caused a significant decrease in SaO₂ in both sexes when administered with placebo (21.8% in men and 19.7% in women). However, this difference was slightly reduced with sildenafil to 20.2% and 19.2%, respectively. Respiratory parameters did not show significant changes after administering sildenafil in any experimental situation. In contrast, cardiovascular parameters showed differences between placebo and sildenafil. After exercise in hypoxia, HR mean values increased by 7.1% in men and 4.6% in women when subjects were administered with sildenafil whilst systolic SAP decreased by 4.3% and 6.7%, respectively. The combination of both parameters expressed as the double product (HR•SAP) did not show significant differences between placebo and sildenafil in any case. Finally, sildenafil administration induced a significant increase in RAT during exercise in hypoxia in women, with a mean increase from 135 to 200 seconds, but not in men (112 to 108 seconds).

These data suggest that sildenafil could improve the exercise capacity at altitude by decreasing the vascular systemic resistance and increasing cardiac output, as is deduced from the increases in HR, the slight decreases in systolic arterial pressure and the greater SaO₂ observed during exercise in hypoxia. Moreover, sildenafil treatment at altitude allows maintaining exercise capacity without increasing heart workload since no variations in the double product were observed.

Key words: Sildenafil. Hypobaric hypoxia. Exercise.

EXERCISE PHYSIOLOGY-IV

Comparison of four methods to assess body composition in Caucasian young adults with Down syndrome

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Introduction: Percent body fat and its body distribution is frequently used as one indicator of overall health fitness and is especially important in some pathologies as Down Syndrome that tends to overweight and obesity. There are several indirect methods to calculate percent body fat with different results that make difficult to compare dataset. Bioelectrical Impedance Analysis (BIA) is an accurate method for measuring body composition. However, some studies questioned its reliability because its determinations are made using algorithms based on BMI. In this study BIA system does not perform its calculations on BMI equation. The aim of this study is to compare four methods of body composition assessment: Sum of six Skinfold thickness (S6SK), Body Mass Index (BMI), Rohrer Index (RI) and BIA in a population with DS.

Methods: 22 young adults with Down Syndrome (DS) were tested (14 males, 8 females), aged 18-38 years (26.77±6.07). Height and weight were measured with standardized procedures. BMI was calculated as weight/height² (kg/m²). RI was calculated as weight/height³ (kg/m³). S6SK were measured following the ISAK protocol for 6 skinfolds (triceps, sub-scapular, supra-spinal, abdominal, thigh and calf) on the right side of the body. BIA analysis was measured with an octapolar system (PROMIS).

Results: Age, height and weight in males were 27.86±6.43 years, 65.44±9.38kg, 160.68±4.85 cms, respectively and 24.88±5.22 years, 57.00±9.14 kg and 145.95±7.80 cms in females. Men were taller and heavier than woman (P=0.001). There were no statistical differences between males and females about BMI, sum of six skinfolds and RI (25.36±3.51 Vs 26.94±5.19, 115.76±33.72 Vs 147.07±39.95 and 15.80±2.30 Vs 15.89±4.21, respectively). However, percenta-

ge body fat when calculated with BIA was significantly greater in females than in males (P=0.01). The observed correlations in body composition measurements between SK, BMI, RI and BIA are reported in Table 1.

Table 1. Cabeza-Ruiz R, et al. R values between Rohrer Index (RI), Body Mass Index (BMI), sum of six skinfolds (S6SK) and Bioimpedance Analysis (BIA) in individuals with DS

		BMI	S6SK	BIA
RI	Pearson Correlation	0.949(**)	0.686(**)	0.806(**)
	N	22	20	16
BMI	Pearson Correlation		0.668(**)	0.591(*)
	N		20	16
S6SK	Pearson Correlation			0.672(**)
	N			16

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

Discussion: The correlation between body weight and height squared means that BMI correlates directly with the height. Thus BMI, as an index of obesity, is not applicable to human populations differing in height as individuals with down syndrome, who are smaller than their pairs without disabilities.

Conclusion: Rohrer index is more accurate that body mass index and the sum of six skinfolds to estimate body fat in individuals with Down syndrome.

Key words: Body Composition. Anthropometry. Bioimpedance. Down Syndrome.

Gender differences in handgrip strength in adults with Down syndrome

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Introduction: Handgrip strength refers to the maximal isometric force that can be mainly generated by the hand and forearm muscles involved in the handgrip performance. The handgrip test gives practical information about bone, muscle, joint and nerve disorders and has been proposed as a possible predictor of mortality and the expectancy of being able to live independently.

The aims of this study are to assess maximal isometric hand strength among a Down syndrome population and to study the possible influence of gender and body composition on this variable.

Methods: 14 males and 8 females with Down syndrome were tested (aged 26.77±6.07 years, weight 62.37 ± 9.97 kg and height 155.32 ± 9.35 cms). Strength variable monitored was maximal isometric strength (MIS) from both hands using an Ergometer Globus dynamometer. Participants performed the handgrip exercise three times with each hand and the best trial was selected. Contracted upper arm perimeter and forearm circumference were measured following the ISAK protocols. Arm and body composition were calculated using an octapolar Promis bioimpedance analyzer (BIA).

Results: Men were significantly stronger (p ≤ 0.01) than women for both hands (right: 29.18±11.79 kg Vs 18.52 ± 5.28 kg; left: 29.72 ± 12.33 kg Vs 19.42 ± 4.93 kg). However, women reached MIS before than men (Table 1).

Table 1. Cabeza Ruiz, et al. Maximal Isometric Strength –MIS- Right and Left (kg) and time to reach MIS (seconds)

		MIS-R (kg)	T. MIS-R (s)	MIS-L (kg)	T. MIS-L (s)
Male	Average	29.18	2.76	29.72	2.64
	SD	11.79	1.57	12.33	1.10
Female	Average	18.52	1.83	19.42	1.91
	SD	5.28	1.02	4.93	0.89
	p	0.009	0.108	0.013	0.103

Results show significant differences between men and women in both perimeters (contracted upper arm and forearm : 31.15 ± 2.06 cm Vs 28.40 ± 2.73 cm. and 26.16 ± 1.56 Vs 23.20 ± 1.62 cm, respectively) and other measures obtained by BIA (arms fat free mass, body muscle mass, and body fat free mass : 4.24 ± 0.68 kg Vs 2.05 ± 0.08 kg, 30.79 ± 3.76 kg Vs 19.38 ± 1.55 kg and 48.72 ± 3.22 kg Vs 32.08 ± 2.74 kg, respectively).

MIS for the right hand correlates with right forearm circumference (r=0.77), body fat free mass (r=0.61), right arm fat free mass, and right arm muscle mass (r=0.64). Also, MIS for the left hand correlates with body fat free mass (r=0.58) and left arm fat free mass (r=0.53). No case correlates with contracted upper arm perimeter.

Discussion: MIS correlates with body fat free mass and arm fat free mass for both hands. Also MIS for right hand correlates with right arm muscle mass. Gender differences in MIS may be due to the higher forearm muscle mass in men than in women with Down syndrome. However, in this study men take longer to reach MIS although they are stronger than women.

Key words: Maximal isometric hand strength. Bioimpedance. Anthropometry. Down syndrome.

The specific endurance tennis test (SET-Test): design, reliability, and validity

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Introduction: A new procedure to assess tennis specific endurance was evaluated as to its application for testing and research purposes.

Materials and methods: 38 trained male tennis players performed a maximal, incremental field test (SET-Test) conducted by a tennis ball throwing machine. 12 players performed the test three times, one with a portable gas analyzer.

Results: Test duration was 13:39 ± 01:34 min:s (6.61 ± 0.82 stages); VO_{2max} was 57.0 ± 6.0 mL·kg⁻¹·min⁻¹; technical effectiveness (TE) was 63.1 ± 9.1 % of successful shots. A TE deflection point (TEDP) was observed at stage 5.2 ± 1.1 (79.6 ± 14.6 % of final stage). A heart rate deflection point (HRDP) was observed in 92% of the subjects at an average of 178.6 ± 8.7 beats·min⁻¹ (92.2 ± 2.7 % of HR_{max}); HRDP significantly correlated with the second ventilatory threshold (VT₂) (r = 0.87, p<0.001). Low to moderate significant correlations (0.35 < r < 0.55, p<0.05) were found between test results and the competitive level of the players. TE together with VT₂ and VO_{2max}, respectively, explained 56% and 53% of competitive level. Physiological and load measurements showed good consistency (intraclass correlation coefficients for HR_{max}: 0.91, coefficient of variation = 1.4%; HRDP: 0.87, 2.5%; final stage: 0.85, 2.0%), somewhat higher than TE parameters (TE: 0.72, 4.7%; TEDP: 0.59, 6.1%). No differences in performance were found when using the portable gas analyzer.

Conclusions: The SET-Test is an objective, valid, and reliable field test for the assessment of load, physiological, and technical efficiency parameters, allowing estimations of the VT₂ in tennis players. Performance predictive capacity is moderate according to the multifactorial character of the game (Figure 1).

Key words: Testing. Oxygen uptake. Performance prediction.

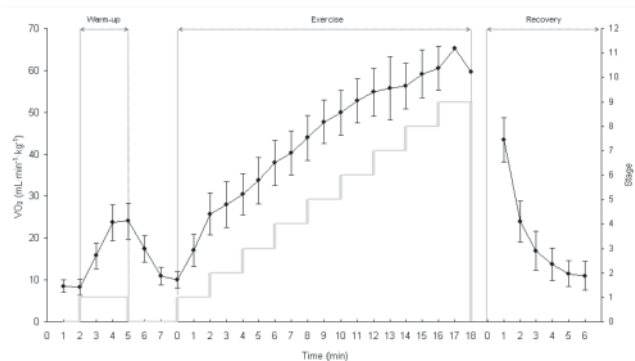


Figure 1. Baiget E, et al. Course of oxygen uptake during the SET-Test in the group of tennis players (n = 38)

Oxygen kinetics during intermittent work

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The time (t) discriminates the speed of activation of the oxidations mechanisms, during an intermittent work (IW) 95 - 100% of the VO_2 Max. The deficit of oxygen (DO_2) of the fast phase of the O_2 kinetics (O_2K) represents the anaerobic work participation.

Objective: To compare the DO_2 during four repetitions of (IW), in two sports.

Materials and methods: Olympic athletes: 4 boxers and 4 judokas. Age (18-24 years); weight (60-75 kg) and height (170-185 cm). WI on treadmill with 2% of slope (protocol LABEMORF: heating 2 min; 4 repetitions of 2 min by 1 of rest). Each repetition represents one round and in the rest the subject remains seated; thus the test is considered specific for boxing. In judo it simulates the modality of the combat. VO_2 Max was measured with $\text{K}4\text{b}^2$ and DO_2 by COSMED software. It was applied ANOVA TWO WAY with and without replications.

Results: In boxing: $\text{DO}_2 = 1905 \pm 597$ ml F NS between three evaluations. The DO_2 between subjects (BS) and rounds was different $F = 3.24$ $p < 0.003$ and $F = 4.83$ $p < 0.003$ respectively; interaction NS. In judo $\text{DO}_2 = 2050 \pm 769$ ml BS $F = 6.48$ $p < 0.007$; between repetitions N.S. Both sports: BS $F = 4.04$ $p < 0.003$ and between repetitions $F = 4.06$ $p < 0.01$.

Discussion: The DO_2 differences BS, demonstrate that the functional answer would be modulated by the characteristics of the sport and by the individual variability. Since the fast phase of the O_2K is considered dependent of the type of muscular fiber and this modality of WI recruit preferably units fast motor-boats, we could think that the results, express the functional answer to specific metabolic requirements.

Conclusion: The WI designed originally for boxing, demonstrated utility in judo, considered of maximal-sub maximal aerobic characteristics, with significant anaerobic participation.

Key words: Oxygen deficit. Intermittent work. Oxygen kinesis.

Highly exercise training of diabetic rats alters endothelium dependant (or not) reactivity of thoracic aorta

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The reactivity of isolated rings has been tested on healthy or diabetic rats (wistar) treated or not by insulin and trained. Training consisted of a 1h-run, 5 days/wk for a total 8 wk on a multilane rodent treadmill. The last month rats run at 25m/min every day. Rats were made diabetic (type 1) by streptozotocin (STZ) injection ;then we observed 1°) that Phenylephrine (PheE) induced contraction is increased in diabetic animals; 2°)on PheE pre-contracted vessels that the Endothelium-Dependent Relaxations (EDR) in the acetylcholine (Ach) as in adenosine-5'-O-(2-thiodiphosphate) (ADPβS) exist and reach maximal values of the order of 70 % in the studied groups. However we don't observe any difference in the amplitude of the Ach - relaxation between the groups. While, for the only concentration of 10^{-7}M , in ADPβS, the amplitude of relaxation seems superior for the trained groups with regard to the untrained groups, that they are diabetic or not. We observe finally that the Ach induced relaxations are strongly inhibited by the N-Nitro-L-Arginine Methyl Ester (LNAME), inhibitor of NO synthase (NOS) in diabetic rats.

Other experiments have to be realized with trained diabetic rats towards the ADPβS transduction mechanism via P2Y purinergic receptors and NO/EDRFor prostacyclin pathways¹.

In conclusion, we confirm several points: 1) the potentialisation in diabetic rats of the vascular smooth muscle contraction induced by PheE, an alpha-adrenergic agonist (alpha 1); 2) the EDR is obtained with Ach; 3) the inhibition of this Ach EDR by L-NAME. Two main points have to be raised: i) the absence of difference, at this stage of the survey, for the Ach EDR and ADPβS responses between diabetic and healthy rats (trained or not). ii) the fact that exercise seems to increase the EDR to the ADPβS(10^{-7}M).

References:

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Key words: Endothelium. Exercise. Diabetes. Nitric oxide. Vasodilation.

EXERCISE PHYSIOLOGY-V

Effects of voluntary running exercise under low- or high-oxygen conditions on the soleus muscle in rats

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Chronic exercise under hypoxic or high-oxygen conditions is believed to induce an improvement in the performance, health, and physical fitness. This study examined the effects of chronic exercise under different conditions of oxygen concentration on the rat soleus muscle. Five-week-old male rats were subjected to normal- (21%), low- (15%), or high- (31%) oxygen concentration with or without voluntary running exercise. The rats in the exercised group were allowed to run voluntarily in a wheel at their own paces for 12 h. Exercise under normoxic conditions caused an increase in the oxidative enzyme activity of type I and type IIA fibers in the muscle. Exercise under high-oxygen conditions exhibited more prominent adaptations in the oxidative capacity of the muscle, i.e., an increase in the oxidative enzyme activity of all types of fibers and a shift of fibers from type IIA to type I. Exposure to low-oxygen conditions with or without exercise caused an increase in the oxidative enzyme activity of type I and type IIA fibers in the muscle. In addition, an enhancement in hemoglobin and free fatty acid concentration was observed under low-oxygen conditions with or without exercise. Similarly, hypoxia inducible factor-1α (HIF-1α) and vascular endothelial growth factor (VEGF) mRNA expression levels in the muscle increased under low-oxygen conditions with or without exercise. Uncoupling protein-3 (UCP-3) mRNA expression levels in the muscle increased under low-oxygen conditions with exercise, but not without exercise. It is concluded that exercise under low- or high-oxygen conditions causes different muscular adaptations. Exercise under high-oxygen conditions exhibits a greater oxidative capacity in the skeletal muscle than that under normoxic conditions, while exposure to low-oxygen conditions with or without exercise enhances the oxidative capacity in the skeletal muscle combined with the changes in HIF-1α and VEGF mRNA expression levels.

Key words: Chronic exercise. Oxidative enzyme. Rat.

Effects of repeated supramaximal exercises on plasma adiponectin, IL-6 and TNF-α levels

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Introduction: Adiponectin is a protein hormone that modulates a number of metabolic processes, including glucose regulation and fatty acid catabolism. Adiponectin is exclusively secreted from adipose tissue into the bloodstream. Exercise causes to increase insulin sensitivity as adiponectin does. Tumor necrosis factor-α (TNF-α) is believed to modulate the release of adipokines including adiponectin and interleukin-6 (IL-6). IL-6 concentration also increases in exercise. We aimed to study the possible effects of repeated supramaximal exercise on plasma adiponectin, IL-6 and TNF-α levels.

Material and method: The study included 14 healthy sedentary adults (18.4-21.4 yrs). Wingate test was performed 5 times with 75 g.kg⁻¹ body weight load with 2-min intervals. Blood samples were collected at rest, immediately after, 15 min and 60 min after the fifth Wingate test. Plasma adiponectin, TNF-α and IL-6 levels were measured.

Results: Plasma adiponectin level (36.7 ± 2.2 μg/ml) 60 min after 5th Wingate test was lower than resting level (37.9 ± 2.1 μg/ml). IL-6 levels immediately after (118.9 ± 41.8 pg/ml) and 60 min after exercise (133.8 ± 34.1 pg/ml) were lower than the resting level (100.9 ± 13.0 pg/ml). TNF-α levels after 5th Wingate test were not different from resting level.

Conclusion: Plasma adiponectin level decreases, IL-6 level increases and TNF- α level does not change after repeated supramaximal exercises.

Key words: Adiponectin. IL-6. Wingate. TNF- α .

Evaluating heart rate recovery after submaximal exercise by means of different models assessing their reliability

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Introduction: Assessment of HR recovery after exercise is used to monitor cardiac nerves adaptation to increased fitness in healthy subjects and cardiac patients and has been proposed as an independent predictor of all-cause mortality. Various models to assess HR recovery after exercise have been proposed, and several methodological differences, such as exercise intensity and recovery duration, have been found even in studies that use the same model of analysis. Nevertheless, but poor is the knowledge of their reliability after exercises at the bicycle ergometer.

Aim: To evaluate the reliability, on a short-term test retest base, of different indexes used to assess HR recovery after 2 levels of submaximal exercise on the bicycle ergometer.

Methods: 21 healthy subjects performed 2 exercises at 65% HRmax and 2 at 80% HRmax. Different HR recovery indexes were calculated. Realibility was assessed by ICC and SEM.

Results and conclusions: Our results show that: 1) assessment of HR recovery after 80% HRmax exercise bring more reliable values than after 65% HRmax exercise; 2) reliability increases as a function of recovery time; 3) calculation of recovered HR area (HRRa, percentage HR by time area recovered) is more reliable than other indexes and is robust against minor variations in workload selection; 4) differences in recovery between 65 and 80% HRmax exercise can be assessed by absolute HR decay (Δ HR) at 2 and 3 min recovery and T30-fast (the smallest time constant over a 30 s period); 5) parasympathetic reactivation can be quantified by T30-fast, that showed higher reliability than other methods.

Key words: Bicycle ergometer. Performance. Heart rate.

The effects of combined exercise, on blood lipids and cytokine of college female students according to the FTO gene polymorphism

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Genetic variants in the FTO gene have been associated with an increased risk of obesity. The purpose of this study was to determine the effects of combined exercise program on body composition, blood lipids, and cytokine according to the FTO gene polymorphism in college female students. This study was to investigate the rs9939609 single nucleotide polymorphism (SNP) of the FTO gene in relation of gene expression in 27 healthy college female students.

The results showed one AA-homozygous, six AT-heterozygous and twenty TT-homozygous respectively. They were divided into two groups, the AA+AT group (n=7) and TT group (n=20). The Hardy-Weinberg equilibrium test was applied to ensure independent segregation of alleles. The combined exercises performed were the aerobic ladder exercise with 60 to 70% (120 to 170 beats/min) of maximum heart rate for 35-40 minutes a day and the circuit weight training consisted of 15-20 repetitions/set/day with 3 days-session/week for 12 weeks. The interaction effect between time and groups showed a significant difference in T-C (p<.05), HDL-C (p<.05) and TNF- α (p<.05).

In conclusion, these results indicate that the combined exercises had positive effectives on the changes of the body composition, blood lipids, and cytokine. These exercises had some effect on the risk of A allele with FTO rs9939609 obesity, however, regular exercise and other environmental factors might affect to get better results for overweight and obese persons. Based on these results of

the study, it is necessary to follow studies associated with long term exercise effects, for reevaluating after the cease of exercise, relative factors with diabetes, sex and age.

Key words: FTO gene. Obesity. SNP. Cytokine.

Effects of anaerobic training on plasma androgen and catecholamine responses to short-term exercise in adolescent boys

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Introduction: The aim of this study was to investigate the effects of a 6 months sprint training program on plasma catecholamine (CA), total testosterone (TES) and sex-hormone binding globulin (SHBG) at rest and in responses to a 6-s sprint in adolescent boys.

Methods: Twelve healthy adolescent boys [training group (TG), n=6; control group (CG), n=6] took part in our study. TG participated in a 6 months sprint training program whereas, CG continued with its normal activity. A 6s-sprint test was performed on a cycle ergometer before training (P1) and after training (P2) in both groups. The same test (P3) was also performed in TG after 5 months of detraining. Plasma adrenaline (A), noradrenaline (NA), SHBG and TES levels were measured at rest, immediately after the warm-up and the 6s-sprint and during the recovery (5 and 20 min).

Results: Lean body mass (LBM) was significantly increased after P2 only in TG. Similarly, maximal power (W_{peak}), expressed in absolute value was significantly increased in TG in P2 (842 ± 47 vs 932 ± 64 , p<.05) but did not change in CG. Significant differences between pre-exercise and post exercise plasma TES concentrations were noticed in P2 in TG only ($15.6 \text{ nmol.l}^{-1} \pm 1.2$ vs 18.8 ± 1.7 , p<.05). SHBG concentrations measured both in response to the warm-up, the 6-s sprint or during the recovery were not significantly different from resting values and no differences were found between the two groups either. Plasma TES concentrations were significantly correlated with the corresponding concentrations of A and blood lactate (La), after the warm-up ($r = 0.46$; p<.05), the 6-s sprint ($r = 0.49$; p<.05) and after 5 minutes of recovery ($r = 0.51$; p<.05).

Conclusion: The results of the present study demonstrated that, in adolescent boys, sprint training can improve plasma TES responses to sprint exercise. The important elevations of plasma A, but also La concentrations, could be involved in this increase of TES responses to sprint exercise.

Key words: SHBG. Testosterone. Lactate. Adolescent.

GENETICS AND MOLECULAR BIOLOGY-I

Acute exercise induces expression of NOS isoforms in skeletal muscle through NF- κ B modulation

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Nitric oxide (NO) appears to be a positive regulator of muscle function during exercise. However, unaccustomed exercise may produce NO in amounts high enough to stimulate inflammatory processes. The synthesis of NO is catalysed by three isoforms of nitric oxide synthase (NOS): neuronal (nNOS), endothelial (eNOS) and inducible (iNOS). Although data have shown that transcriptional regulation is crucial in the initiation of NO production by NOS, regulation of NOS isoforms expression during acute exercise has not been examined.

Aims: To investigate gene expression of NOS isoforms after acute eccentric exercise and the effect of the inhibition of the transcription factor NF- κ B by pyrrolidine dithiocarbamate (PDTC).

Methods: Twenty four male Wistar rats were allocated to four experimental groups: rested control group; rested group treated with PDTC (two dose of 100 mg/kg); acutely exercised group after an intermittent protocol downhill (-16°) at 16 m.min⁻¹ for a total of 90 min; 5 min/bout (18 bouts) separated by 2 min rests

POSTER COMMUNICATIONS

and acutely exercised group treated with PDTC. In samples of deep vastus lateralis muscle, chromatin immunoprecipitation assays (ChIP) and analysis of gene expression (RT-PCR and Western Blot) of NOS isoforms were performed.

Results: The binding of NF- κ B to the nNOS, iNOS and eNOS promoter was undetectable by ChIP in control rats, whereas it was evident after an acute bout of exercise. This increased binding was partially abrogated with the administration of PDTC. Results also showed a significant increase in mRNA levels (nNOS: +218%, iNOS: +142% and eNOS: +108%, vs control, respectively) and in protein content (nNOS: +228%, iNOS: +227% and eNOS: +231%) of the three NOS isoforms. Treatment with PDTC decreased significantly mRNA and protein levels of NOS isoforms.

Conclusion: The presence of NF- κ B binds to the three NOS isoforms promoters and the effects of PDTC confirm that this transcription factor modulates the expression of nNOS, iNOS and eNOS during an acute bout of eccentric exercise.

Key words: Exercise. NF- κ B. Nitric oxide.

The type I collagen (COL1A1) gene and anterior cruciate ligament injuries

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Background: Anterior cruciate ligament (ACL) ruptures have been reported as the most severe injury sustained in a sporting population. Although various intrinsic and extrinsic risk factors have been identified, the exact aetiology is not yet fully understood. A familial predisposition toward rupturing the ACL has been identified, suggesting that genetic factors are implicated in these injuries.

Objectives: To investigate if the COL1A1 gene, which encodes for the α 1 chain of type I collagen - the major polypeptide component in ligaments, is associated with increased susceptibility to rupture of the ACL.

Subjects: One hundred and seventeen Caucasian subjects with clinically and surgically diagnosed ACL injuries, as well as 129 Caucasian physically active controls subjects (CON) without any history of previous ligament or tendon injuries were recruited.

Methods: All subjects were genotyped for the functional Sp1-binding site polymorphism (SNP rs1800012; IVS1+1023G>T) within the COL1A1 gene.

Results: There were no observed statistical differences in the genotype (P=0.89) or allele (P=0.72) distributions between the ACL and CON groups. It is however interesting to note that the rare TT genotype was significantly (P=0.03) under-represented in the ACL population (5% vs 0%). This observation should however be interpreted with caution because of the low frequency of the TT genotype in the subjects.

Discussion: Although no genotype or allele distributions between the ACL and CON groups were observed, it is interesting to note that no TT genotype in subjects with ACL ruptures were observed. Further research is required to evaluate the possible protective role of this genotype in ACL ruptures.

Key words: ACL. Soft tissue. Rupture. Tear. Polymorphism.

Are endothelial progenitor cells mobilized after acute hypobaric hypoxia exposure?

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Endothelial progenitor cells (EPC) are primitive cells which have the potential to differentiate into mature cells. An increase in EPC has been observed in human and experimental animals after very different situations or conditions such as: myocardial infarction, dilated cardiomyopathy, cardiac surgery with cardiopulmonary bypass and after 12 weeks of physical exercise. Several studies have found that elevated concentrations of EPC have a better correlation with clinical outcomes. On the other hand, hypoxia sessions have been historically used to improve physical condition and to treat several illnesses, mostly in the countries of the former Soviet Union and at present this practice has become widely extended into the sport world, even with several commercialised forms.

The aim of the present study was to determine if a short-term intermittent hypoxia exposure, at a level well tolerated by healthy humans and previously proved by our group as able to increase EPO and erythropoiesis, was also able to mobilize EPC and increase their homing or induce tissue neovascularization. Four healthy male subjects members of the research group (GV, CJ, AR and JLV), without toxic habits or medications and different levels of habitual physical activity were submitted for three consecutive days to 3 hypoxia exposure sessions (3h at equivalent to 5000m). Blood samples were obtained from an antecubital vein during 3 consecutive days immediately before and 24 h, 48 h, 4 days and 7 days after the last day of hypoxic exposure. Number per μ l and percentage of CD34+ cells and CD133+ cells were determined as endothelial stem cell markers as well as number of CD45+ cells per μ l and % of lymphocytes.

The main result of the present study was the lack of a clear-cut effect on number of EPC after 3 sessions of hypobaric hypoxia equivalent at an altitude of 5000m on a group of 4 healthy men of around 50 years-old. This apparent lack of response does not seem attributable to the age of the participant subjects, since it has been described a clear PC response to physical exercise in a group of 63 year-old men. However, two possible reasons can explain this fact: 1) the relative short duration of the hypoxic stimulus -a total of 9 h-, whereas in a positive neurogenesis study in rats stimulus of 4 h per day for 2 weeks have been applied and several studies with a positive EPC response to physical exercise take about 3 months; or 2) the relative low intensity of the stimulus in our study -in order to make it tolerable to a wide majority of healthy people- compared with some studies in vitro, in which a clearly more hypoxic atmospheres were used. Obviously, longer or more frequent hypoxia sessions may be applied however, no much more intense hypoxic sessions seem reasonable to be used.

Key words: Endothelial progenitor cells. Acute hypobaric hypoxia.

Leptin receptor 170 KDa (OB-R170) protein expression is reduced in obese human skeletal muscle

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Leptin is a hormone mainly secreted by the adipocytes that plays a crucial role in the regulation of appetite, body fat mass and basal metabolic rate. Leptin binds to specific receptors which are expressed in several tissues including the skeletal muscle. Obesity is associated to insulin and leptin resistance, and both insulin and leptin share part of their intracellular signaling pathways in the skeletal muscle. A potential mechanism that could explain leptin resistance in obesity is a down-regulation of leptin receptors (OB-R) and/or up-regulation of suppressor of cytokine signaling 3 (SOCS3, which blunts JAK-2-dependent leptin signaling). To determine if in obesity OB-R and SOCS3 protein expression are down- and up-regulated, respectively, deltoid and vastus lateralis muscle biopsies were obtained from 20 men.

Methods: Twenty young male subjects participated in this investigation and was divided in two groups: control (mean \pm SEM), age: 31.2 \pm 4.8 years; height: 184.3 \pm 9.4 cm; body mass: 90.9 \pm 13.2 kg and percentage of body fat 24.8 \pm 5.8) and obese (mean \pm SEM), age: 30.4 \pm 7.4 years; height: 183.9 \pm 8.2 cm; body mass: 114.9 \pm 8.2 kg and percentage of body fat 34.9 \pm 5.1). Muscle biopsies were taken from the musculus vastus lateralis and deltoid and processed for the assessment of the OB-Rs, perilipin A and SOCS3 by Western blot. Body composition was determined by dual energy x-ray absorptiometry, and fasting serum insulin, glucose and leptin with ELISA and IRMA.

Results: Skeletal muscle OB-R170 (the long isoform of the leptin receptor) protein expression was 28 and 25% lower (both, P<0.05) in arm and leg muscles, respectively, of the obese compared to the controls. However, the expression of the other two OB-R isoforms (OB-R128 and OB-R98), as well as the expression of perilipin A (a protein exclusive of adipocytes), was similar in control and obese subjects. Moreover, we found also that the deltoid muscle, which has a fibre type composition similar to that of the vastus lateralis, has greater number of leptin receptors than the vastus lateralis, regardless of body composition. In normal

weight subjects, SOCS3 protein expression is similar in the deltoid and vastus lateralis muscles. However, in obesity, SOCS3 protein expression is 59% higher in the vastus lateralis compared to the deltoid muscle ($P<0.05$). Vastus lateralis SOCS3 protein expression and HOMA were correlated ($r=-0.70$, $P<0.05$).

Conclusions: Thus, obese subjects have reduced number of long isoform of the leptin receptor in the leg muscles and increased SOCS3 protein expression. The combination of these two findings could explain an increased leptin resistance in the leg muscles in obesity. The increase of SOCS3 protein expression could also play a role in the greater insulin resistance in obesity, as indicated by the observed negative correlation between vastus lateralis SOCS3 protein expression and HOMA.

Supported by grants from Ministerio de Educación y Ciencia, Spain (BFI2003-09638, BFU2006-13784 and FEDER), Gobierno de Canarias, Spain (PI2005/177) and Universidad de Las Palmas de Gran Canaria, Spain (UNI2006/05).

Key words: Obesity. Leptin Receptor. Leptin Resistance.

Muscle damage and inflammatory response induced by eccentric exercise in the elderly

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Introduction: In older people, regular physical activity is important for the increase or preservation of aspects of physical function such as muscle strength and power, balance, flexibility, endurance, or mobility. However, it is well known that acute exercise, particularly eccentric exercise, induces muscle damage and changes in many components of the immune system in young people. For this reason, we were aimed to investigate the eccentric exercise effects in the muscle damage and inflammatory response in the elderly.

Material and methods: 13 healthy men (66-75 years), performed an eccentric bout, which consisted in 10 sets of 10 repetitions, using as eccentric movement the negative phase of the 45°-inclined leg-press. The load was equivalent to the 60% of the maximal voluntary isometric contraction (MVIC). The strength loss, the delayed onset muscle soreness (DOMS), the accumulation of proteins in blood, NF- κ B activation, the expression of genes involved in the inflammatory response such as the expression of the inflammation-related genes inducible nitric oxide synthase (iNOS), cyclooxygenase-2 (COX-2) and interleukin-6 (IL-6) were measured in peripheral blood mononuclear cells (PBMC) before, immediately after and at 3 h after cessation of a bout of eccentric-damaging protocol.

Results: The eccentric exercise caused a reduction in MVIC, quadriceps muscle soreness, an increased of creatine kinase (CK) and lactate (LDH) in blood immediately after the exercise and at 3 h and NF- κ B activation. Translocation of NF- κ B to the nucleus resulted in significant increased ($p<0.05$) gene expression of enzymes with an inflammatory function, such as iNOS and COX-2. The mRNA level and protein content of IL-6 were also increased after the eccentric-damaging bout. Therefore, the symptoms of muscle damage, the strength loss and the inflammatory response after an eccentric-damaging bout are in agreement with data from the literature concerning exercise-induced muscle damage in young people.

Conclusion: A bout of acute eccentric exercise in the elderly induces muscle damage, changes in NF- κ B activation and in the expression of the inflammation-related genes.

Financed by grant LE024A07 from the Junta de Castilla y León (Spain). Conducted with a grant from the Secretary of State of General Education of Universities.

Key words: Muscle damage. Inflammation. Eccentric exercise.

GENETICS AND MOLECULAR BIOLOGY-II

Increased frequency of the homozygous DD angiotensin converting enzyme genotype in Spanish top level gymnasts

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Introduction: Angiotensin-converting enzyme (ACE) genotype has been reported to be associated with physical performance. While an excess of D allele has been observed in anaerobic disciplines, I allele has been associated with endurance athletes in different studies.

Materials and methods: The distribution of ACE genotypes has been investigated in 315 elite athletes (207 men and 108 women) of more than 30 different disciplines. Out of them 12 athletes (9 men and 3 women) practising artistic gymnastic have been selected. The election was based on the high static and low dynamic demands of this discipline, group IIIA of Mitchell's Classification. The ACE genotype, insertion (I) or deletion (D) alleles, was ascertained by polymerase chain reaction using two pairs of primers. The ACE genotype was compared with the rest of our population of elite athletes.

Results: The ACE DD homozygote genotype was observed in 8 gymnasts (67%), 5 men and 3 women, ACE II homozygote was present in 2 cases (17%) and ACE ID heterozygote in other 2 cases (17%). Genotype frequency differs significantly ($X^2=8,055$, $p=0,02$) from the rest of our population of elite athletes (DD 31,3%, DI 57%, II 11,5%).

Conclusions: The ACE DD genotype is more prevalent among Spanish top level gymnasts than among others Spanish elite athletes, suggesting a positive association between the allele D and performance in high static component disciplines. Nevertheless, this study concerned a population of limited size, so more studies are necessary to confirm the results and to explain the reason of the prevalence of DD ACE genotype in this discipline.

Key words: Angiotensin-converting enzyme (ACE). Polymorphism. Sport.

Cardiac remodeling in endurance athletes: effects of NAD(P)H oxidase P22PHOX polymorphism on the right ventricular function and on pro-inflammatory biomarkers

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Exercise increases the production of ROS through a mechanism involving the NADPH oxidase system. We focused our attention on p22phox, a subunit of the NADPH oxidase, and on its allelic polymorphism C242T. This polymorphism is known to affect functional activity of NADPH oxidase. We investigated whether the p22phox C242T variants were associated with a different pro-inflammatory and cardiocirculatory response to endurance training. The group of study consisted of 98 marathoners, 37±4.4yr, with similar training story. After an echocardiographic-doppler analysis, subjects underwent a maximal stress test during which both cardiac and pulmonary parameters were monitored. The polymorphic frequency was 49.3% CC, 37.7% CT, 13% TT. Left ventricle echocardiographic parameters showed no significant differences among the genotype groups with respect to Left Ventricle Ejection Fraction and Stroke Volume. On the other hand, TT respect to CC and CT genotype subjects showed a better right ventricle (RV) performance, expressed by echocardiographic tricuspid annular plane systolic excursion (TAPSE) (2,99 ±0,4 mm versus 2,66 ± 0,4 mm 2,95 ± 0,5 and, respectively, $p<0.03$). This observation was in line with the analysis of maximal oxygen consumption that revealed that TT showed a higher VO2 max compared to those of CC and CT genotype groups (63,54±5,9 versus 65,08±5,2 and 67,5±8,0ml/kg-1/min-1 respectively, $p<0.005$). These functional data were supported by a different oxidative and inflammatory response to the stress tests acting on endothelial function. It is well known, in fact, that endothelial function influences cellular mechanism underlying cardiopulmonary performance. Indeed, we observed in CC homozygotes an evident and significant increase of urine MPO levels (up to seven fold relative to the basal value, with a mean of 4.13±2.35%, $p<0.005$); this response was less evident in the presence of the T allele: CT response, indeed, was characterized by a two fold increase (2.17±0.35 fold, $p<0.005$) of urine MPO, whereas in CC genotype no differences or a decrease of the urine MPO concentration were observed (83±33.35%). In conclusion, p22phox C242T variants may influence both the cardiovascular and the oxidative response to the aerobic training acting.

Key words: Heart remodelling. MPO. VO2 max.

POSTER COMMUNICATIONS

Left ventricular hypertrophy in endurance athletes. The role of AT₁-R polymorphisms

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Background: Whenever ACE polymorphisms might cause left ventricular hypertrophy (LVH) or not is still controversial. Most of known physiological effects of angiotensin II are mediated by angiotensin type 1 receptors (AT₁-R). The hypertrophic effect exercise-related of AT₁-R A1166C polymorphism has not been cleared yet. Hence, this study is aimed to evaluate the role of AT₁-R polymorphisms in LVH mediated by ACE in endurance athletes.

Methods: A group of 74 white healthy male endurance athletes, aged between 25 and 40 years, were enrolled in this study. All of them participated primarily in isotonic sports, training for at least >10 h/week, for at least 5 years. The ACE genotype (insertion [I] or deletion [D] alleles) was ascertained by polymerase chain reaction (DD 35, ID 36 and II in 3). Athletes with the DD genotype were compared with their ID counterparts, concerning LV mass index (LVMI). No difference was found between the 2 groups concerning age, blood pressure, heart rate and echocardiographic data.

Results: Considering only 71 athletes having DD-or-ID genotypes, the AT₁-R genotypes were AA in 44 (20 DD vs 22 ID, $p = 0.878$), AC in 24 (11 vs 13, $p = 0.867$), CC in 5 (4 vs 1, $p=0.341$). The Table 1 showed higher LVMI in DD group than in ID group. This was mainly due to higher LVMI in ACE-DD+AT₁-R-AC/CC association. LVMI in subjects with ACE-DD+AT₁-R-AA was similar to the one assessed in ACE-ID+AT₁-R-AC/CC group ($p=0.880$). The association between ACE-ID and AT₁-R-AA provided the lowest LVMI. The presence ACE-DD+AT₁-R+AC/CC was strongly associated with LVH, defined as LVMI>131g/m², (OR=4.6, $p=0.029$).

Conclusions: The ACE DD polymorphism might cause LVH in endurance athletes in presence of AT₁-R-AC/CC polymorphism.

Table 1. Di Mauro M, et al. Left Ventricular Mass Index according to ACE and AT1-R genotypes

AT1-R genotype	ACE genotype		p
	DD	ID	
<i>Any AT1-R</i>			
n pts	35	36	
LVMI (g/m ²)	141±21	129±19	0.014
<i>AT1-RR AA</i>			
n pts	20	22	
LVMI (g/m ²)	134±18	127±18	0.215
<i>AT1-RR AC/CC</i>			
n pts	15	14	
LVMI (g/m ²)	150±23	133±20	0.040

Legend. LVMI = left ventricular mass index.

Key words: ACE polymorphism. Endurance athletes. Left ventricular hypertrophy.

Increases in anti-apoptotic protein would be involved in beneficial effects of physical exercise

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Background: Exhaustive exercise induces oxidative stress, generating reactive oxygen species (ROS) and subsequently damage, leading to lipid peroxidation,

DNA damage, protein oxidation and mitochondrial disturbances. The anti-apoptotic effect of Bcl-2 is known and recent evidence suggests that the mitochondrial Bcl-2 family pathway may be a target in exercise and aging.

Aim: The purpose of our study was to determine the systemic induction of Bcl-2 in tissues after a protocol of eight weeks of aerobic exercise training in rats. We hypothesized that moderate intensity treadmill exercise would be a naturally method to produce an over expression of the anti-apoptotic protein Bcl-2.

Methods: Seven four-months-old male Wistar rats were used in this study. The animals were randomly divided into 2 groups, an exercise group (EX) (n=3) and a sedentary group (REST) (n=4). Endurance-trained animals were exercised 5 d/wk during 8 wks in an animal treadmill at an intensity of 75%VO₂max.

Results: Our results indicate that moderate exercise produce a systemic over expression of Bcl-2 by increasing significantly its protein levels in lung, heart, liver and kidney.

Conclusions: Our results shown that aerobic exercise training can induce a systemic protection in order to elevate apoptotic threshold in different tissues (lung, heart, liver and kidney).

Key words: Reactive oxygen species. Apoptosis. Mitochondria.

Treatment with recombinant human erythropoietin has no effect on mitochondrial biogenesis and myogenesis in rat skeletal muscle

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Introduction: Administration of recombinant human erythropoietin (rHuEPO) improves aerobic physical performance in sport. The main action of EPO is to regulate the production of red blood cells. However recent research indicates that EPO has pleiotropic effects on the body well beyond the maintenance of red cell mass. EPO receptors have been detected in skeletal muscle.

Aims: The aim of our study was to examine the effects of the treatment with rHuEpo on mitochondrial biogenesis and myogenesis in rat skeletal muscles.

Material and methods: Fourteen male Wistar rats (3 months old) were randomly divided into two experimental groups: control (n=7) and treated with rHuEpo (n=7). The animals were injected three times a week for three weeks, with a subcutaneous dose of 500 I.U. of rHuEPO alpha. We determined different blood parameters (haemoglobin, haematocrit and reticulocytes) and the skeletal muscle protein levels of transcription factors involved in the mitochondrial biogenesis and myogenesis pathways.

Results: Our results show that administration of rHuEpo during 3 weeks has no effect on the following mitochondrial biogenesis pathway (e.g. PGC-1, NRF-1, Tfam, Cit C and COX-II) in soleus muscle. Moreover we did not find any treatment effect in the protein levels of transcription factors involved in myogenesis (e.g. MyoD, Myf 5) and in angiogenesis (VEGF)

Conclusions: Treatment with rHuEpo has no effect on the mitochondrial biogenesis and myogenesis pathways in soleus muscle.

Key words: Erythropoiesis. Doping. Skeletal muscle.

HEALTH IMPROVEMENT AND AGING DELAY THROUGH PHYSICAL ACTIVITY-I

Development of the functional capacity in older adults who undertake a community physical exercise programme

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Introduction: Physical exercise programmes for older adults are becoming more and more popular due to the population weight of this age group in the developed

societies and the need to improve their quality of life and to prevent dependence, prolonging their years of active life.

Materials and methods: Over the 2006-2007 season, we assessed the functional capacity of a group of volunteers comprising sixty women and thirty-five men under 65 years old, which were included in a community exercise programme (2 sessions [90 minutes] per week) consisting of multi-component exercises (strength, flexibility, endurance, balance/coordination), and 45 minutes per week of water activities, over a period of 8 months. Both at the beginning and at the end of the programme, an anthropometric assessment (weight and height) and a functional capacity assessment (Senior Fitness Test, by Rikli and Jones, 1999) were performed. Initial and final results were compared (data normality was established through the Kolmogorov-Smirnoff test) and the Student test for paired data was applied (significance level < 0.05).

Results: Women's average age is 69.4± 3.6 years; men's is 71.7± 4.0 years. The anthropometric and functional capacity data can be seen in Table 1. The functional capacity values are better for strength in arms and legs, endurance, and dynamic balance in men. Shoulder and leg flexibility values are better in women. Both men and women show a favourable development of the BMI (significant improvement of both). Men improve slightly in almost all of functional capacity parameters, except for leg strength and flexibility. Women show a significant improvement in all functional capacity parameters, apart from leg flexibility.

Conclusions: An eight-month multi-component physical activity programme (two days a week), combined with water activities (once a week), improves the BMI in older adults of both sexes notably. After undertaking this community exercise programme, women (who, in this case, represent the largest group in the research), showed the greater improvement in their physical abilities.

Key words: Elderly. Exercise. Functional capacity.

Physical activity, cardiorespiratory fitness and blood pressure in university students

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Introduction: Health benefits of physical activity are widely recognized. Greatest health benefits will be achieved by increasing physical activity among the least active members.

Cardiorespiratory fitness and physical activity may have significantly different relationships to cardiovascular and heart diseases risk. Recent studies presume that being unfit warrants consideration as a cardiovascular and heart disease risk factor, distinctly from inactivity. The reductions in relative risk are nearly twice for cardiorespiratory fitness than physical activity.

The aim of this study was to analyze the relation of physical activity, cardiorespiratory fitness and blood pressure in university students. We focused on blood pressure because it is one of the most important factors associated to cardiovascular risk.

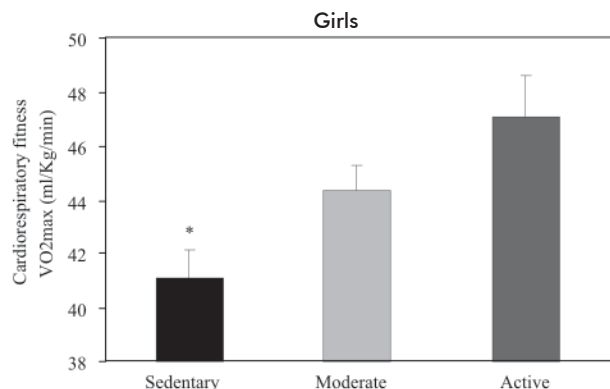
Material and methods: 399 university students aged between 18 and 21 years old were randomly selected (111 boys and 288 girls). Leisure physical activity data was analyzed using a validated self-reported questionnaire (Basque Government, 2004). Students were classified attending to proposed physical activity categories as sedentary (<1 time/week), moderate (1-2 times/week) and active (>2 times/week) (ACSM; 1998).

Cardiorespiratory fitness was assessed by the measurement of VO₂max using the Astrand test. Blood pressure was measured with a validated automatic sphygmomanometer

All statistical analyses were done with (Anova, Scheffe and Pearson) correlations.

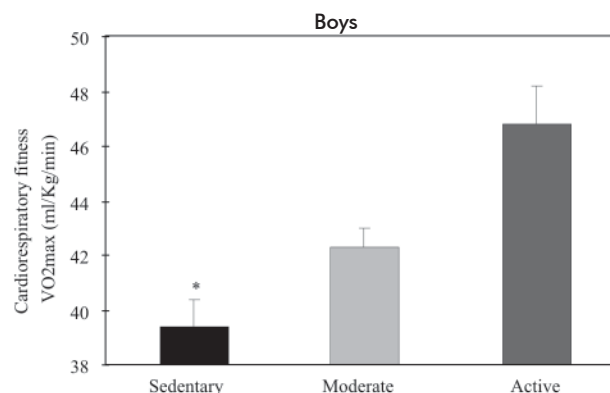
Results: ANOVA analyses revealed a statistical significant positive relationship between physical activity category and aerobic fitness (VO₂max). Students classified as active had better cardiorespiratory fitness values than sedentaries (p<0.05). There was no statistical significant relationship between physical activity category and blood pressure (Figures 1 and 2) (Table 1).

We found a significant negative correlation between blood pressure and aerobic fitness (VO₂max) (p<0.01).



* Scheffe's test p<0.05, between sedentary and active girls

Figure 1. Hoyos I, et al.



* Scheffe's test p<0.05, between sedentary and active boys

Figure 2. Hoyos I, et al.

Tabla 1. Hoyos I, et al.

	Girls Maximum aerobic capacity VO ₂ max	Boys Maximum aerobic capacity VO ₂ max
Systolic blood pressure	R = - 0.293 **	R = - 0.211 *
Diastolic blood pressure	R = - 0.308 **	R = - 0.253 **

Pearson's correlation, * p<0.05, ** p<0.01

Conclusions: Our results confirm the importance of physical activity in the improvement of cardiorespiratory fitness. They also revealed the importance of being fit in the prevention of cardiovascular disease risks and highlight the importance of maintaining an adequate physical fitness distinctly from physical activity from youth.

Key words: Physical activity. Physical fitness. University students.

Running between companies as a factor to stimulate the practice of physical activity in a workplace

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POSTER COMMUNICATIONS

Introduction: The adoption of health promotion programs in the workplace is a widespread practice in medium and large organizations. As part of scope of shares, and as one of the major challenges, stimulating the practice of physical activity is a common point in these programs. The purpose of this study was to verify if the stimulus participation in a running event between companies can be used, by the employers, as a tool for behavioral change in physical activity habits.

Background: In the last 4 years, each year, the Pepper Communication, with Marazul Sports Medicine Institute medical coordination, is organizing the called CorporateRun, a running event between the employees of companies, divided into two categories: 10 km and 5 km and met in groups of 4 participants. With unlimited number of groups by company, which added the times determine the overall standings.

Materials: Were on average 5 thousand runners (3-6 thousand), of 125 different companies, aged between 18 and 60 years old, 73% men and 27% of women.

Methods: Questionnaire previously applied the running, questioning about the physical activity habits.

Results: We found: 43.5% of participants already practiced running, 66.5% started a running program to participate in the CorporateRun.

In the group that started running program because the event, 72.3% said continue the running program after de event.

Conclusion: Running events, like a CorporateRun, shows itself an effective tool to encourage employees to behavioral change, especially, in physical activity programs, with effective contribution to the health promotion programs success into the companies.

Key words: Health promotion. Running. Workplace.

Comparison of Group- and Home- based physical activity intervention in Japanese subjects with metabolic syndrome

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Introduction: Prevalence of metabolic syndrome (MS) has become a major health problem in Japan and developed countries. Regular physical activity (PA) contributes to improved MS risk factors. Although group- or home-based PA intervention was often conducted, it is unknown which PA interventions were more effective. The purpose of this study was to compare the efficacy of these two interventions in Japanese subjects with MS or several MS risk factors.

Methods: Seventy three subjects with MS or several MS risk factors were selected either Group-based PA Intervention (GPI: N=40) or Home-based PA Intervention (HPI, N=33). Finally, the results were analyzed for 67 subjects (GPI: n=38, HPI: n=32) at post-intervention (after 12-weeks) and for 64 subjects (GPI: n=35, HPI: n=29) at follow-up (after 1-year). Both interventions had 12 week duration. All participants received two or three face-to-face counseling, one behavioral feedback letter, and lecture about health and exercise information. The behavioral goals in both groups were daily walking step. Subjects in GPI have a 10 exercise and recreation classes for 60-minutes. The main outcome measures were body weight, body mass index (BMI), percent fat (%FAT), waist circumference (WC), waist-hip ratio (WHR), and MS risk factors.

Results: Program completion rates were 95.0% in GPI and 97.0% in HPI. After 12-weeks, participants in both groups lost their weight, BMI, %FAT, and WHR. But weight loss in GPI was superior. Participants in both groups increased walking steps, endurance fitness, and lean body mass (P<0.05). After 1-year, both groups improved 6 risk factors (weight, BMI, WC, HDL-c, LDL-c, HbA1c).

Conclusions: These results suggested that group-based PA intervention had short-term beneficial effects on weight loss. However, group-based intervention was as effective as home-based intervention on weight loss and MS risk factors in the long term.

Acknowledgment: This study was supported by Grant-in-Aid for Scientific Research (20700516).

Key words: Physical activity. Group-based intervention. Home-based intervention.

Relationship body mass index-physical activity in workers of the National Institute of Rehabilitation, Mexico

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Overweight and obesity are important health issues in Mexico. Both factors harm a 70% of the entire population. Affected individuals are at increased risk for cardiovascular diseases, diabetes, hypertension and other health disorders. Its prevention, control and handling can be achieved through changes in lifestyle: a balanced diet and an adequate prescription of physical activity (PA) considering the American College of Sports Medicine recommendations of at least 300 min/week of moderately intense cardio to lose weight or maintain weight loss. This study was focused toward the screening and analysis of physical activity habits in a sample of workers of a health facility.

Methods: Data of age, body mass index (BMI), type, volume (minutes/day) and frequency (days/week) of PA were collected from 290 men and women; intensity was obtained from Ainsworth classification in metabolic equivalents (METs). Data were analyzed using descriptive statistics and frequency analysis. Pearson correlation coefficients (r) were determined to investigate the associations among the variables (P≤0.05) (SPSS for Windows, v12.0).

Results: Fifty-six percent of women and 72% of men have overweight/obesity. The most affected age group was the one of 30-39 years for both sexes. From the overweight/obesity population 24.2% and 59.2% practice unsupervised PA (women and men respectively). Most of women (57.1%) walk 30-60 min/day, 2 days/week in average; men prefer to run (33.3%) 30-60 min/day, 2-3 days/week. A positive correlation was found between volume-METs (r=0.434) for men.

Conclusions: As expected, there was a strong relationship between overweight/obesity and sedentary lifestyle. However, there was also a high percentage of individuals with the disease in spite of practicing PA. A prevailing need exists to implement programs in order to sensitize individuals and engaged them in a PA routine and to evaluate and prescribe adequate PA for individuals already engaged that allows them to reach all health benefits.

Key words: Body mass index. Physical activity habits.

HEALTH IMPROVEMENT AND AGING DELAY THROUGH PHYSICAL ACTIVITY-II

Fatness is a better predictor of cardiovascular disease risk factor than cardiorespiratory fitness in adolescents

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Introduction: The aim of this study was to examine the associations of cardiorespiratory fitness (CRF) and fatness with cardiovascular disease (CVD) risk factors in adolescents, and to determine whether CRF is better predictor than fatness to CVD risk factors in adolescents.

Methods: A total of 183 adolescents (116 boys and 67 girls) aged 16-18 years participated in the study. CRF (VO₂max) was measured using a portable gas analyzer (K4b², Cosmed) during the 20 m Shuttle Run Test. Fatness was established by body mass index (BMI, weight/height²) in kilograms per meters squared, abdominal skinfold thickness (AST) in millimeters and total percent body (%BF) estimated using the Siri's equation. CVD risk factors included triglycerides (TG), fasting total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and ratio of total to HDL cholesterol (TC:HDL-C). To determine the independent association of fatness and CRF with CVD risk factors, we calculated correlation coefficient of Pearson.

Results: In males, BMI, AST, and %BF were significantly associated with TC:HDL-C (r=0.415 to 0.432, P<0.01), HDL-C (r=-0.329 to -0.408, P<0.01) and LDL-L (r=0.222 to 0.249, P<0.05). In females, BMI, AST, and %BF were significantly associated with HDL-C (r=-0.280 to -0.346, P<0.05), and AST was associated with TC:HDL-C (r=0.293, P<0.05). In contrast, for both genders, CRF was not associated with any CVD risk factors (P<0.05). Overall, fatness was more strongly and consistently associated with CVD risk factors than CRF, in boys and girls.

Conclusions: These results suggest that fatness is a better predictor of CVD risk factor than CRF in adolescents. Although it is well established that CRF attenuates the health risks associated with fatness. Consequently, regular aerobic physical

activity should be considered as a very important instrument for the prevention and reduction of CVD risk in adolescents.

Key words: Cardiorespiratory fitness. Fatness. Adolescents.

Cardiovascular adaptations following aerobic fitness training, detraining and re-training

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The purpose of this study was the functional evaluation on the working muscle and on the cardiovascular adaptations, as well as the behaviour psychological matching young women and older women following aerobic fitness training, detraining and re-training. Ten young-adult women (age: 21 ± 2.6 yrs, height: 165 ± 0.04 cm, weigh: 59 ± 7.57 Kg, BMI: 21.64 ± 2.54 Kg/ m², HR: 73.5 ± 7.07 bpm, BP: 88.9 ± 9.0 mmHg) and ten older women (age: 42.2 ± 3.31 yrs, height: 163 ± 0.08 cm, 61.8 ± 7.66 Kg, BMI: 23.13 ± 2.37 Kg/m², HR: 71.02 ± 9.4 bpm, BP: 91.23 ± 5.4 mmHg), practicing aerobic fitness. Cardiovascular adaptations data and state anxiety scores were collected during three different experimental period (training, detraining and re-training). Participants worked on overage at an intensity corresponding to 60-80% of their HR reserve. After fitness lesson HR, VO₂ max and IRI test, were significantly higher in young women than older women in each of three periods. No differences were observed between groups about BP and STAI-1, after fitness lesson in each of the three periods. Only in young women, VO₂ max in detraining period, was significantly reduced, while in re-training period VO₂ max was significantly increased. Finally, before of the fitness lesson during each period study, state-anxiety showed significantly higher score in young women than older women.

The results of the present study confirm a fitness activity program induces beneficial effects on the cardiovascular adaptations and metabolic parameters in both older and young women. Although, in order to evaluate the influence of aging on cardiovascular adaptations and metabolic parameters to endurance training in our observation about VO₂max reached as well as in HR and finally physical efficiency before and after fitness lesson is relevant the differences between young and older women. A possible explanation could be attributed to more intense aerobic fitness programme in young women. Very important is to consider that the success of aerobic fitness training, derives from the ability of the instructor to monitor continuously participants' HR, in order to realize an individualized workout, especially if the class includes older individuals or beginners. Finally, only regular aerobic fitness training induces substantial improvements in cardiovascular adaptations, metabolic parameters and enhanced level of well-being.

Key words: Aging. Females athletes. Functional evaluation.

Ultrasound densitometry; review of normative data in different populations

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The ultrasound densitometry is one of the most effective methods in assessing the elastic properties of bone. The use of the calcaneus, for its easy accessibility is the most common, being developed various equipment for measurement.

A systematic review is carried out between 2000 and 2008 in order to ascertain the state of affairs on the normative values of European populations, compared to other populations (Asian American).

Of a total of 346 original identified by two independent reviewers and using the tool RefWorks, in order to eliminate duplicate studies that appeared simultaneously on the bases consulted, were reduced from the original total, which met the requirements to 16, with the final figure which the review.

The findings of the review are:

- Densitometers ultrasonic contact and water, show greater precision "in vivo" and "in vitro", but the densitometers are used by contact ultrasonic gel.
- BUA values and SOS / VOS are dependent on the age and sex, with women showing the lowest values. Whatever the race or ethnic group studied.
- BUA values and SOS / VOS are not strongly dependent of the level of exercise.

Key words: Quantitative. Ultrasound. Parameters.

Longitudinal changes in overweight parameters, lipoproteins and maximal oxygen consumption in male former athletes

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Introduction: Aging is characterized by gradual changes in body composition and maximal oxygen consumption (VO₂max), which have mostly been attributed to decreased physical activity (PA). However, there is very little data about the longitudinal changes in ex-athletes who are presumably more physically active in their later life than the general population. Therefore, the purpose of the study was to evaluate longitudinal changes in overweight values, lipoproteins and VO₂max in male ex-athletes during a 7-year period and to determine the possible effect of long-term patterns of change in PA.

Methods: 7-year follow-up measurements were performed in 2001-2002 (48.6 ± 5.7 yrs) and in 2008 (55.4 ± 5.9 yrs) in 28 former male athletes: PA level (questionnaire), anthropometric measurements – waist and hip circumferences, WHR, BMI, and body fat percentage (DXA), lipoproteins (CHOL, HDL-cholesterol, LDL-cholesterol, triglycerides) and VO₂max (modified Balke test on treadmill).

Results: All the male former athletes showed a relatively stable high physical activity level during 7 year follow-up. 17 subjects even increased their physical activity level. Significant differences were determined in BMI (26.9 ± 3.9 vs. 27.4 ± 4.0 , $p=0.03$), waist circumference (93.5 ± 10.8 vs. 95.5 ± 11.5 cm, $p=0.02$), body fat percentage (18.2 ± 5.5 % vs. 24.4 ± 6.9 %, $p=0.000$), LDL-cholesterol (3.4 ± 1.1 vs. 3.7 ± 1.0 mmol/L, $P=0.053$) and VO₂max/kg (42.4 ± 9.5 vs. 38.1 ± 8.4 ml/min/kg, $P=0.000$) measured in 2001-2002 and 2008, respectively. During the 7 years, the mean weight of the subjects increased 2.0 kg (-9.7 to 11.0 kg), and the mean body fat increased 5.1 %. The PA level (min/week) significantly correlated with overweight values and VO₂max/kg. The strongest inverse relationship was found between PA and fat percentage ($r=-0.613$, $p=0.005$).

Conclusion: The data of the present study show that overweight and maximal oxygen consumption are more significantly related to physical activity level than aging in male ex-athletes.

Key words: Ex-athletes. Physical fitness. Fat percentage.

Alterations in the mechanical properties of the calcaneus in runners evaluated using quantitative ultrasound densitometry

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Running influences the mechanical properties of calcaneus, since a large part of the stress generated falls on the latter.

A cohort of 56 marathon runners were studied using ultrasound bone densitometry (QUS), that permits evaluation of the mechanicals properties of the bone.

The values of BUA and VOS were higher in the control group ($p<0.001$) but we found different behaviour in the evolution of these parameters with relation to the control group.

Material and methods: The study was carried out on 56 runners, aged between 30 and 60 years old, with weekly physical training schedules, over 10 hrs who had no any type of local calcaneus or general pathology at the time of carrying out the study

Sahara Ultrasonic densitometer from Hologic was used, measuring by same operator both calcaneus, giving mean value obtained. For statistical analysis were carried out: The Kolmogorof-Smirnoff test, T – Student, Variance analysis with Tukey's HDS test, and regression studies.

Results: The mean BUA y VOS values for the study group were: BUA: 103.41 dB/MHz, VOS: 1658.40 m/s., while in the control group they were: 83.94 dB/MHz (BUA) and 1627.73 m/s. (VOS).

We observed that a calcaneus subjected to exercise of the type carried out by runners, behaves in a different manner to one not subjected to sport. It results in a bone with a tendency to greater elasticity, and a higher density which starts being lost earlier, when compared to those of sedentary people.

Key words: Calcaneus. Ultrasound densitometry.

HEALTH IMPROVEMENT AND AGING DELAY THROUGH PHYSICAL ACTIVITY-III

Effects of aerobic training on left ventricular function assessed by echocardiography, in untrained postmenopausal women

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The purpose of this perspective study was to assess the effects of aerobic training on ecocardiography parameters of left ventricular (LV) diastolic and systolic function in healthy, untrained, postmenopausal women.

Material and methods: 35 women (43-59 years old, mean 52.3 +/- 3.9) underwent echocardiography-Doppler examination before (PRE) and after (POST) exercise training in order to assess systolic and diastolic function. Maximal oxygen consumption (VO₂max) predicted was determined for each subject by administering a treadmill exercise test. Subjects performed 50 minutes of walking, four times a week at 50%-60% heart rate reserve. Exercise training lasted 12 weeks and Rockport Fitness Walking test with treadmill runner was used to estimate cardiorespiratory fitness.

Results: After the training period they showed a significant increase of predicted VO₂max with Rockport Fitness Walking test (23.8 +/- 5.9 ml/kg/min vs 33.9 +/- 5.7 ml/kg/min, p < 0.001). Systolic and diastolic blood pressure values were significantly lower than in pre training period, (130 +/- 10.7 mmHg vs 127 +/- 11.7 mmHg, p=0.01 and 81 +/- 6 mmHg vs 78 +/- 5 mmHg, p < 0.002, respectively). No significant differences were seen in variation of either weight (69.9 +/- 15.36 kg vs 69.61 +/- 14.46 kg, p=0.46) or body surface area (87.7 +/- 12.14 m² vs 86.5 +/- 11.55 m², p=0.07). PRE and POST significant echocardiographic-doppler parameters variations are summarized in Table below. Left ventricle (LV) mass index showed an increase (85±14,5 g/cm² vs 93±20,4 g/cm²), although not statistically significant. In addition, linear regression showed that Midwall Fractional shortening (MFS) improved after the training period regardless by reduction of systolic pressure.

Conclusions: Our preliminary results indicate that exercise training in post menopausal women can improve the VO₂max, LV diastolic and systolic function assessed by echocardiography Doppler. These findings suggest that regular aerobic exercise may favourably modulate adverse cardiovascular effects due to menopausal stage (Table 1).

Table 1. Granieri M, et al.

	PRE	POST	p
LV Ejection Fraction %	63.3±11.3	69.1±9.6	0.007
E/A doppler	1.07±0.32	1.15±0.33	0.04
Isovolumetric contraction period (ms)	103.3±65.8	73.22±17.25	0.03
MFS (%)	18.18±5.5	23.77±5.75	0.005

Key words: Post menopause. Aerobic exercise. Left ventricular function.

Physical fitness and heart rate profile to exercise of middle-aged and older women during three years of exercise training program: they continue improving

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Introduction: Exercise training has been recommended to counteract the effect of aging on physical fitness and health. On the other hand, the lack of time of modern life makes difficult to reach the exercise recommendation of 2-3 and 3-6 times-a-week resistance and aerobic training, respectively. However, there is little information about the effect of lower training frequency in middle-aged and older people. Our purpose was to analyze the effect of a two times-a-week

exercise training program on physical fitness and heart rate (HR) profile to exercise of middle-aged and older women.

Methods: 89 sedentary middle-aged and older women (51.2±9.8 years; BMI: 25.1±3.8 Kg/m²) were submitted to an exercise training program with aerobic (20 minutes at 60-75% of reserve HR, resistance (2-3 sets of 8-12 repetitions at 60-80% of 1- RM in 9-11 exercises), and stretching exercise (10 minutes), performed two times-a-week for 36 months. Muscle strength (1-RM) were measured at baseline, and after six (post-6), twelve (post-12), twenty-four (post-24) and thirty-six (post-36) months of follow-up. Graded exercise test was performed at baseline, post-12, post-24 and post-36 months of follow-up to evaluate cardiorespiratory fitness and HR response to exercise. Repeated measures ANOVA were used to analyze data during follow-up. Turkey post-hoc test was used to determine significant data indicated by ANOVA.

Results: Muscle strength increased 35.4% after 6 month of training, followed by lower but significant increases of 8.4%, 4.2% and 5.1% at post-12, post-24 and post-36 month of follow-up, respectively (p<0.01). Cardiorespiratory fitness was continuously increased by 5.4%, 6.1% and 2.3% at post-12, post-24 and post-36 month of follow-up (p<0.05). Resting HR was reduced by 6.1 beats per minute at post-12, did not changed at post-24, and reduced 5.3 beats per minute at post-36 month of follow-up (p<0.05). Peak HR did not changed significantly during the follow-up, and recovery HR reduced 6.15, 5.0 and 7.9 beats per minute at post-12, post-24 and post-36 month of follow-up (p<0.05).

Conclusion: The results suggest that two times-a-week multi-component exercise training was enough to improve physical fitness and HR profile to exercise of middle-aged and older women, and that the subjects continued to improve even after a three-year follow-up, although in an lower intensity.

Key words: Aging. Exercise. Cardiorespiratory fitness. Muscle strength. Heart rate.

Impact of age and physical fitness on resistance exercise intensity progression of men: A pilot study

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Introduction: It has been recommended that older people must increase resistance exercise (RE) training intensity more slowly than young people, independently of health or physical fitness status. However, there is no scientific evidence supporting this recommendation. Our purpose was to compare the RE intensity progression between older (sedentary or actives) and young men.

Methods: Fifteen sedentary healthy men, divided in young (YG; n = 8; age = 25.9±3.7 years, BMI = 23.5±5.1 kg/m²) and older group (SOG; n = 7; age = 67.4±5.2 years; BMI = 26.5±4.5 kg/m²), and six older runners (ROG; age = 71.3±3.0 years; BMI = 22.7±0.5 kg/m²) were submitted to a 13-week RE program. RE was performed 2 times a week, and consisted of 2 sets of 8 to 12 repetitions in 9 exercises; initial intensity = 60% of 1 repetition maximum (1-RM). Exercise intensity was increased in 5-10% each time 2 sets of 12 repetitions were performed in a determined exercise. 1-RM test was used before and after follow-up to measure muscle strength. ANOVA was performed to analyze the mean exercise intensity progression between YG, SOG and ROG, respectively. Post-hoc Bonferroni t test was used to determine significant data indicated by ANOVA.

Results: Pre-exercise muscle strength was lower in the SOG (19.4±1.8%) and ROG (13.4±6.0%) than in the young group (p<0.05). There were no significant difference in the pre-exercise muscle strength between SOG and ROG. Muscle strength was significantly improved after RE training, with no significant difference between groups (YG = 24.4±5.0%, SOG = 22.8±6.6%, ROG = 25.6±5.1; p=m/s). RE intensity progression was not significant different between YG and SOG for any exercise. However, ROG had greater RE intensity progression than YG and SOG for leg press (20.7±5.8% (YG), 19.0±7.1% (SOG), 34.3±4.0%; p<0.01) and abdomen (25.7±6.5 (YG), 19.7±6.1% (SOG), 44.8±9.5; p<0.001), than YG for biceps curl (37.3±11.4 x 63.3±3.1; p<0.01), and than SOG for bench press (38.6±16.3 x 51.0±5.1; p<0.05), leg curl (30.7±13.9 x 53.7±10.8; p<0.01), and calf raise (20.1±9.0 x 35.3±8.1; p<0.01). The RE was safe, with no injuries or cardiovascular events occurring during the study.

Conclusions: The results suggest that healthy sedentary older men were able to safely increase RE intensity at similar way than young men. Moreover, physically active older men were able to increase RE intensity at greater way than young and sedentary older men.

Key words: Aging. Physical fitness. Resistance exercise. Muscle strength.

Care center for integral older adults with type 2 diabetes and hypertension. Strategic plan for its creation

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The study refers to propose a strategic plan for the creation of a center for comprehensive care for older adults with type 2 diabetes and hypertension in the Libertador municipality of Merida State, Venezuela, with the aim of raising strategies for operation and organization. The research developed theoretical aspects such as care centers, which are institutions which provide maximum opportunities to the user in the maintenance of health and improving the quality of life, also discussed the management, planning as a strategic model of the stages to follow to create such a center, and organizational structures, in addition to other items. The methodology used responded to a descriptive field research, supported with a design project feasible. Participants were selected intentionally to which they applied a questionnaire SWOT analysis. The proposal consists of a strategic plan which defines the mission, vision and values of the institution to create, to further the objectives, tasks, strategies and management actions, the respective action plan and an organizational structure and programs to meet a standard of care for older adults with diabetes and hypertension, among other things needed to guide its operation. Accordingly, a building that meets the requirements for promoting this kind of comprehensive health care institution and become a solid platform for the launch of alternative programs to improve health and quality of life of diabetic and hypertensive individuals of Municipality.

Key words: Center for care. Strategic planning. Type 2 diabetes. Arterial hypertension.

Short-term endurance training failed to stimulate the antioxidant capacity and the mitochondriogenic pathway in skeletal muscle in aged rats

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Background: During aging, skeletal muscle undergoes sarcopenia, a condition characterized by a loss of muscle cell mass and alterations in contractile function. The origin of these decrements is unknown, but evidence suggests that they can be partly attributed to an increase in oxidative stress and a decrease in the mitochondrial bioenergetic capability. It is well known that endurance training up-regulates the antioxidant capacity and the mitochondriogenic pathway in young skeletal muscles. By stimulating these pathways, endurance training could also constitute a possibility to prevent the decrease of mitochondrial energy production in aged muscles.

Objective: This study was designed to determine the effect of a short-term endurance training on the antioxidant capacity and on the mitochondrial biogenesis pathway in skeletal muscle in aged rats.

Design: 24 young (5 months) and aged (22 months) male Wistar rats were exercised for 3 weeks following an aerobic endurance training. The intensity of the training was set at 75% VO_{2max}.

Results: Aerobic training results in an elevation of plasma xanthine oxidase activity in both young and aged rats (p<0.01) but no changes were found in catalase and MnSOD muscle protein content. Significant increases of protein content of PGC-1 (p<0.01), NRF-1 (p<0.01), TFAM (p<0.001) and cytochrome c (p<0.01) were found after training in soleus of young rats whereas no changes were found in aged rats.

Conclusion: These results are in accordance with a previous work in which we showed that the training-induced increase of low concentrations of reactive oxygen species (ROS) can be considered beneficial in the skeletal muscle of young rats, because it activates the expression of key transcription factors involved in mitochondrial biogenesis. However, a short-term endurance training failed to activate this pathway in skeletal muscle in aged rats. The high concentrations of ROS in aged muscles could limit the signal effect of ROS generated during muscle contraction.

Key words: Sarcopenia. Free radicals. Aging. Training. Skeletal muscle. Hormes.

IMAGING DIAGNOSTICS IN SPORTS MEDICINE-I

Ulnar collateral ligament injury diagnosis by ultrasound, a case report

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Introduction: The diagnosis of the pulled elbow in children by ultrasound is described in the literature, but the traumatic diagnosis of the ulnar ligament in adults is a very interesting possibility for clinicians.

Roller hockey player 20 years old, international player in the junior national team, he complains about pain and functional capacities decreased for training in his elbow for two weeks after fall.

The patients explain a fall on his left elbow with his body on it and the hand pronated.

The physical examination shows cutaneous erosion in the external side of the elbow, no vascular or nervous alterations, the medial and lateral ligaments of the elbow were stable, the rom of the joint is preserved, no joint effusion, but the palpation of the radial head and the pronosupination were painful.

No previous traumatic injuries in the medial history of the patient.

A radiological study is performed without signs of injury.

An ultrasound was performed showing a partial rupture of the ulnar ligament.

The scanner despite injuries of the bone or cartilage, and the resonance of the elbow confirm this diagnostic.

Due to the time after the acute injury and because the player was susceptible to be selected for the national junior team to play the world championship we decided no to immobilize the elbow and an active rehabilitation programme is proposed. In three weeks the patient was training normally with the rest of the team.

A new ultrasound study was performed showing the complete recuperation of the ligament.

Conclusion: The diagnosis by ultrasound of the ulnar ligament injuries is possible and an effective tool for clinicians.

Key words: Ulnar ligament. Ultrasound. Partial rupture.

Pelvic apophysitis in young soccer players: report on 15 cases diagnosed through ultrasonography

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Introduction: Apophysitis for traction mechanism an injury that appears in 9-15 y.o. who are under an intense sporting life.

Enduring repetitive tractions on secondary nucleus of ossification can produce microfractures on bone-cartilage junction. The injury normally shows as an acute or subacute inflammation where a tendon is attached. In soccer players, it is a consequence of hip muscles flexing and extension through running, jumping and ball-kicking.

Material and methods: We report 15 young soccer players who suffered apophysitis on the pelvic bone (2005-08). In all the patient we use both anteroposterior X-ray of the pelvis and ultrasonography(US). US offers a higher sensitivity for the physis changes than simple radiology. The image in US is a thicker-looking physis or a pulled-up bone associated with oedema and local neovascularisation.

The treatment applied has always been on the conservative side. We recommended 3 weeks of exercise withdrawal in those changes in US exploration but a normal radiography. And 6 weeks in those cases with changes in US and in radiography images. After the resting period we recommend both muscular and fitness reconditioning, reeducation of specific movements and reintroducing training.

Results: The physis usually affected are, in order of frequency:

- AIIS- rectus femoris insertion. (Cuveland-Hëuk) (8 cases).
- ASIS- sartorius tendon insertion. (Dupas) (3 cases).
- Ischiatic tuberosity- ischiotibials tendons. (Kramser) (2 cases).
- Iliac crest- of Tensor fasciae latae, Obliquus externus abdominis and Latissimu dorsi on the external lip, and transversus abdominis, quadratus lumborum, sacrospinalis and iliolumbar on the internal lip. (2 cases).

The AIIS is the physis affected more often, and the mechanism is generally through kick movements. We did not experience any reinjuries

Conclusions:

- The physis nucleus is the weakest part of the transmission chain insertion-tendon-muscle.

POSTER COMMUNICATIONS

- Ultrasonography is a useful technique to diagnose this entity. It is non-invasive, non ionizing, cheap, easy and reproducible method in these cases.
- Pelvic apophysitis shows a benign course. Last season we detected a decrease in the number of these injuries, possibly thanks to the prevention programmes we introduced as well as to the awareness raising campaigns we directed to coaches and trainers..

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Muscular injuries diagnosed by ultrasound and blood analysis in football players

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Asturian Delegation Spanish Football Players Mutuality

Introduction: Muscle injuries constitute the most frequent reason of consulting for football players.

It is necessary to establish a precise diagnose from a clinical and anatopathological point to know the prognostic and the period needed for recovery.

The primary element for a muscle injury consists in exploration (examine, eccentric and concentric resistance, stretching), and the patient medical history. To identify the anatomical lesion we need to carry out certain tests such as ultrasound and blood analysis.

The aim of this study was to verify if the ultrasound and blood analysis are good complementary test to predict the time of recovery of a muscle injury.

Material and methods: 57 medical histories with regards to muscle injuries were revised. All the cases had received ultrasound and blood tests. These medical notes were taken from a time period 2000-2008.

This study was conducted using 56 males a 1 female ranging in age from 12 till 39 years old.

The ultrasound machine used was Toshiba Nemio 4D.

The blood analysis machine used was Roche Hitachi Cobas 6000 (C501)

In blood analysis creatine kinase and ferritin parameters were taken. We considered positive $ck > 200U/L$ and ferritin $< 30ng/ml$

Results: The age of patients that had more muscle injuries was 18 years old (12,28%). 42,10% of the muscle injuries were in hamstrings. 38,59% patients had ferritin low levels in blood analysis. 10,52% patients had ck high levels in blood analysis (Table 1).

Table 1. Rodas JA, et al.

Clinical exploration	Ultrasound	Blood Analysis recovery (days)	Time for
+	+		63,6
+		+	66,15
+	+	+	69,4
+	-		39,33
+	-	-	33,5
-	+		31,15
-		+	36,38
-	+	+	36

Conclusions: Ultrasound and blood analysis are good complementary tests to predict the time of recovery of muscle injuries. Time of recovery was higher in patients with ferritin low levels. Ferritin low levels could be a risk factor of muscle injuries.

Key words: Muscular injuries. Ultrasound. Football players.

KINANTHROPOMETRY-I**Somatotype of baseball players at european level**

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Introduction: In Spain baseball is one of the little-known sport disciplines. There are teams in the Spanish league which compete at European level. This research was carried out with players in Spain's top division, who also compete in European cups. The aim of this study was to show the anthropometric data of 217 baseball players in European competitions.

There exists little anthropometric research on these athletes in Europe; therefore, a specific study on them is of vital importance.

Materials and methods: Two hundred and seventeen players in the Spanish top division in season 2006/2007 and in European cups this year were surveyed. All measurements were taken by an experienced anthropometrist, a member of GREC (Grupo Español de Cineantropometría – Spanish Group of Kinanthropometry) and FEMEDE (Federación Española de Medicina del Deporte – Spanish Federation of Sports Medicine), following the recommendations and protocols of ISAK (International Society for the Advancement of Kinanthropometry). Anthropometric measurements included weight, height, skinfolds (triceps, subscapular, biceps, ileocrestal, supraspinal, abdominal, anterior thigh, medial leg and axillary), diameters (bistyloid, bipectonyle humerus and bipectonyle femur), and perimeters (contracted arm, relaxed arm and leg).

As an indirect adiposity measure, body mass index (BMI) was calculated according to the formula: weight (Kg) / height (m)². Body composition and somatotype were determined following De Rose and Guimaraes (1980) and Heath and Carter (1967), respectively. Statistical analysis of data was performed using the Statistical Package for Social Sciences (SPSS version 11.0 for Windows).

Results: Tables 1 and 2.

Table 1. Clavijo-Redondo AR, et al.

Category	Height	Weight	Endo	Meso	Ecto
European Level	181,81	81,2	5,7	3,5	2,7

Table 2. Clavijo-Redondo AR, et al.

CATEGORY	BMI	% FAT	% Muscle	% Bone	% Residual
European Level	23,6	25,3	40,1	10,5	24,1

Conclusions: From the results of this research it is possible to rely on a wide database of anthropometric data of baseball players competing at European level. This is the first morphological study on the somatotype of baseball players in Spain and in Europe. The studied sample of players at European level is enough for the obtained anthropometric data to be looked up and compared with future studies in this field. Thus, this research has contributed to increase the arsenal of information which coaches and trainers possess to work in this sport, which, in turn, will be to the advantage of sports clubs to achieve their goals. Therefore, this study will be a very useful tool for coaches and trainers, who will be able to plan the season with reliable anthropometric data.

Key words: Somatotype. Baseball. Europe.

Anthropometric study of baseball players at European level (basemen and fielders)

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cology, University of La Laguna. Spain; ⁷Service of Traumatology and Orthopaedic Surgery, HUC, University of La Laguna. Spain; ⁸Sports Physiotherapist

Introduction: In Spain baseball is one of the little-known sport disciplines. There are teams in the Spanish league which compete at European level. This research was carried out with players in Spain's top division. The aim of this study was to show the anthropometric data of fielders and basemen in European competitions.

There exists little anthropometric research on these athletes in Spain; therefore, a specific study on them is of vital importance.

Materials and methods: A hundred and forty-eight players in the Spanish top division were surveyed, 76 of which were basemen and the remaining 72 were fielders in season 2006/2007. All measurements were taken by an experienced anthropometrist, a member of GREC (Grupo Español de Cineantropometría – Spanish Group of Kinanthropometry) and FEMEDE (Federación Española de Medicina del Deporte – Spanish Federation of Sports Medicine), following the recommendations and protocols of ISAK (International Society for the Advancement of Kinanthropometry). Anthropometric measurements included weight, height, skinfolds (triceps, subscapular, biceps, ileocrestal, supraspinal, abdominal, anterior thigh, medial leg and axillary), diameters (bistylloid, biepicondyle humerus and biepicondylar femur), and perimeters (contracted arm, relaxed arm and leg).

As an indirect adiposity measure, body mass index (BMI) was calculated according to the formula: weight (Kg) / height (m)². Body composition and somatotype were determined following De Rose and Guimaraes (1980) and Heath and Carter (1967), respectively. Statistical analysis of data was performed using the Statistical Package for Social Sciences (SPSS version 11.0 for Windows).

Results: Tables 1 and 2.

Table 1. Clavijo-Redondo AR, et al.

POSITION	Height	Weight	Endo	Meso	Ecto
BASEMEN	181,56	84,19	5,3	4,7	1,7
FIELDERS	182,11	84,37	5,6	3,2	1,8

Table 2. Clavijo-Redondo AR, et al.

POSITION	BMI	% FAT	% Muscle	% Bone	% Residual
BASEMEN	25,4	22,9	41,17	10,5	24,1
FIELDERS	25,5	23,3	43,3	10,2	24,1

Conclusions: From the results of this research it is possible to rely on a wide database of anthropometric data of baseball players competing at European level. This sample of players in the two groups studied according to their position, baseball basemen and fielders at European level, is enough for the obtained anthropometric data to be looked up and compared with future studies in this field. Thus, this research has contributed to increase the arsenal of information which coaches and trainers possess to work in this sport, which, in turn, will be to the advantage of sports clubs to achieve their goals.

Therefore, this study will be a very useful tool for coaches and trainers, who will be able to plan the season with reliable anthropometric data of their basemen and fielders.

Key words: Kinanthropometry. Basemen. Fielders.

Association of digit ratio (2D:4D) with world rankings in female fencers

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The digit ratio between the second and the four fingers (2D:4D) is a widely studied putative marker of prenatal androgen levels while the absolute finger length is a putative marker of pubertal-adolescent androgen levels. In order to study the prenatal programming of sporting success, it has been investigated the associations of the 2D:4D ratio and absolute finger length with sport performance.

The sample used to develop the research was composed by 87 female world-class épée fencers. After receiving participants' informed consent, their name, nationality, age, height, weight, fencing hand, duration of international career (years of attendance of world cup competitions), and current and highest past world rankings were recorded. Following standard practice, length of index fingers (2D) and ring fingers (4D) was measured from palmar-view photocopies of athletes' right (R) and left (L) hands by two trained, mutually blinded investigators, using digital vernier calipers measuring to 0.01 mm.

Results show that lower (masculinized) 2D:4D significantly corresponds to better current as well as highest past world rankings, when the associations are controlled for the most salient factors (height, weight, and years of international experience) for the rankings in this sample. Longer (masculinized) fingers also are associated with world rankings, but these effects are attenuated to insignificance in the same three controls.

This pattern of results may suggest that, for sporting success, prenatal hormonal influences have predominance over pubertal-adolescent ones. Supplemental findings include a much higher prevalence of left-handedness in this sample of elite athletes, relative to the female general population, and slightly lower (more male-typed) 2D:4D and better world rankings in left-handers than in right-handers. These findings add to evidence for sex-hormonal prenatal programming of aptitude across a variety of sports.

Key words: Testosterone. Prenatal programming. Hormonal masculinization.

Somatotype in young male kayakers

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Introduction: Kinanthropometric evaluation can provide a lot of information which can be used for talent identification in elite sport. Olympic men kayakers are considered homogeneous in shape and physical size, with a value of Somatotype Attitudinal Mean of 1.1¹. The aim of this study was to describe the somatotype of young kayakers and to compare it with the somatotype of Olympic sprint paddlers.

Methods: Fifty-five young kayakers (13.7 ± 0.6 years-old) were measured using a battery of 10 anthropometric dimensions: stature, body mass, 4 skinfolds (triceps, subscapular, supraspinal and medial calf), 2 breadths (biepicondylar Humerus and Femur) and 2 girths (Arm flexed and tensed and maximum calf). All variables were measured on the right side of the body and were taken by a Level 2 anthropometrist certified by the International Society for the Advancement of Kinanthropometry (ISAK). The procedures followed the ISAK guidelines². The somatotype, the Somatotype Attitudinal Mean and the difference between somatotype means were calculated using the method of Carter and Heath³.

Results: The mean somatotype for young male kayakers was 2.6 ± 1.1 - 5.0 ± 1.0 - 3.1 ± 1.1, with a Somatotype Attitudinal Mean value of 1.49. The difference between somatotype means of Olympic paddlers (1.6 - 5.7 - 2.2) and the subjects who participated in this study was 3.34.

Conclusions: The mean somatotype demonstrates that young kayakers are best described as balanced mesomorphs, as the Olympic paddlers. The value of Somatotype Attitudinal Mean shows a higher heterogeneity in the younger group, while the difference between somatotype means indicates that the differences between Olympic and young kayakers are statistically significant.

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Key words: Kinanthropometric. Somatotype. Kayakers.

Kinanthropometric reference study of Andalusian football players

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Introduction: Between the different football teams, the data of height and weight of their players vary enormously, not being the stature a determinant of

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the success in this sport modality, although if it could determine the selection of role played. Objective: the purpose of this study is to create kinanthropometric values of reference (body fat percent (FP), muscular percent (MP), skinfolds summation and somatotype) classified by positions (defenders, midfielders, forward and goal keepers) of Andalusian team. Material and method: 226 football players of 2^o and 3^o division. With the purpose of obtaining uniformity in the anthropometric study, the norms and techniques of measurement of the ISAK have been followed (International Society of the Advancement of Kinanthropometry) by personnel credited according to level 1 of accreditation of this society (Table 1).

Table 1. Fernández Chamizo EM, et al.

POSITION	Weight	Height	Env
Midfielders	71.8+/-7.1	177.4+/-6.1	178.2+/-7.5
Goal keepers	80.6+/-8.6	182.4+/-4.1	184.2+/-4.7
Forwards	72.78+/-6.7	177.3+/-5.9	177.84+/-6.7
Defenders	74.87+/-7.1	180.60+/-5.4	181.27+/-6.8

POSITION	FP	MP	BMI
Midfielders	7.70+/-1.1	50.74+/-1.3	22.81+/-1.4
Goal keepers	8.74+/-1.9	50.60+/-1.4	24.22+/-2.1
Forwards	7.85+/-1.6	50.95+/-1.7	22.85+/-1.7
Defenders	7.72+/-1.5	50.57+/-1.4	22.95+/-1.7

POSITION	Endomorph	Mesomorph	Ectomorph
Midfielders	2.04+/-0.45	4.71+/-0.78	2.58+/-0.7
Goal keepers	2.45+/-0.6	5.05+/-0.69	2.20+/-0.69
Forwards	2.05+/-0.6	4.74+/-0.8	2.43+/-0.86
Defenders	2.06+/-0.68	4.62+/-0.95	2.65+/-0.9

Conclusion: From these data we have kinanthropometric values of reference of football players to regional level. We verified that somatotype of these players is similar in relates other national and international players.

Key words: Football. Kinanthropometric. Body fat percent.

Study of the corporal composition and the somatotype in expert and recreational climbers

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In a sport category where is carried out a vertical movement of the body along a sheer wall which has a component of difficulty in addition, the anthropometrics characteristics of the athlete perform an essential role. 21 active subjects who practise sport rock climbing have been evaluated, organized in 2 groups of level: expert climbers (EE) with variations in the degree of performance between 7a and 8a, and recreational climbers (RC) with a variable performance between 6a and 6c. In the record of anthropometrical measurements it was used the anthropometric material recommended by the ISAK. The body mass study was carried out by the Matiegka's tetra compartment pattern. It has been put into practise different formulas and equations according to the age, the sex and the physical activity level of the sample. With this we have develop a strategy to obtain the best combination of equations for this kind of athletes. The analysis of the somatotype has been realized putting into practise the Heath and Carter's method. The fat mass values in the group EE are inferior to the recreational group, $4,23 \pm 0,73$ vs. $5,79 \pm 1,8$ Kg, with a significant difference statistically. When it is compared the results of muscular mass between the expert climbers groups and recreational ones does not exist significant differences, $41,16 \pm 4,85$ vs. $41,55 \pm 4,78$ Kg. The somatotype average of the experts group is mesomorph-ectomorph with the same predominance of the components mesomorphics and ectomorphics. The somatotype average of the recreational group is ectomorph-mesomorph. The body mass and the fat weight in expert climbers are inferior to the recreational ones, to not being a determinant factor in the performance. For the practice rock climbing in elite performers, the suitable somatotype in expert climbers is mesomorph-ectomorph.

Key words: Corporal composition. Somatotype. Climbing.

KINANTHROPOMETRY-II

Body mass index profile of primary, secondary and preuniversity students in different areas of Andalusia

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Introduction: The goal is to set up a profile of the Body Mass Index of students in primary, secondary and baccalauréat in urban and rural Andalusian.

Materials and methods:

- 1166 subjects (539 boys and 624 girls).
- Students of the courses 5th and 6th grade, 1st, 2nd, 3rd and 4th of ESO, and 1st and 2nd high school.
- Municipalities of urbanization as a major capital Granada and Almería capital, and rural and Adelaide and Olula del Rio de Almería, Noalejo (Jaén) and Estepona (Málaga).
- Determining the weight, height and Body Mass Index (Weigh Tanita TBF-300 and a standard height of straight branches).

The procedure was performed by weight using a scale, remaining an individual standing in the center of the platform, devoid of clothes, and with the weight distributed equally on both feet and without support, and the procedure for the fit the subject remains standing, arms along the body and the buttocks and the back upright.

Results: The results which are presented below represent the differences comparisons underweight, overweight and obesity, among different groups (urban and rural areas) (Figure 1).

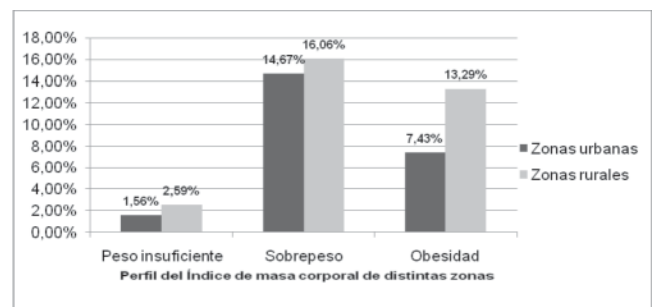


Figure 1. De la Cruz Márquez JC, et al.

Conclusions: The measures of underweight, overweight and obesity in children from rural areas are higher for measures of urban localities. This aspect is considered normal to have a big difference in socioeconomic level, in lifestyle and eating habits.

There is a minimal difference in measures of underweight and overweight among urban and rural areas. Obesity showed a big difference if boys and girls from rural areas with regard to urban locations.

Key words: BMI. Overweight. Children.

Anthropometric techniques in the evaluation of muscle mass of badminton players

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Introduction: The quantification of muscle mass is very important, since it is a part of the body mass closely related to health and sport performance. The aim of this study was to determine the muscle mass in badminton players through anthropometric techniques and to identify the most appropriate tetracompartamental division for this population.

Materials y methods: 37 male badminton players from 15 to 19 years old were studied during the X Spanish Championship of Junior Badminton. 55 anthropometric variables were registered, including weight and height, skin folds, heights, lengths, diameters and perimeters according to ISAK norms. The evaluation of muscle mass was obtained by the formulas of Heymsfield, Martin, Drinkwater, Doupe and Kerr. The analysis of residual mass and bone mass was done by the Wurch and Von Döbeln equations modified by Rocha, respectively, and the analysis of fat mass was done by Faulkner, Brozek and Siri equations.

Results: The equations of Martin Doupe overestimated muscle mass, while that of Heymsfield underestimated it. The average estimated muscle mass was 44 % of total weight and that of fat mass was 13%.

With the six methods of analysis we obtained average values very close to 100 % of the real weight of the athletes. In the following table the percentage of error of the estimated weight in relation to the real weight, measured on a scale, is analyzed.

Conclusions: The method of tetracompartimental division that best approached the real weight, as measured on a scale, were the following: residual mass (Wurch), bone mass (Rocha), fat mass (Faulkner) and muscle mass (Drinkwater at 98,18%, Kerr at 98,45%).

Table 1. Rodríguez E, et al.

Brozek	Drinkwater	Rocha + Wurch		Kerr	Faulkner
	Siri	Faulkner	Brozek		
2,75 ± 3,26	2,29 ± 2,98	-1,81 ± 3,56	3,02 ± 4,14	2,55 ± 3,38	-1,55 ± 3,75

Key words: Kineanthropometry. Tetracompartimental division. Junior athletes.

Anthropometric selection in young football players

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Introduction: Although in theory the need of anthropometrical selection in football is obvious, in practice we find more and more deviation from the standards. The football player model is tall, robust, powerful and able to face "the fight" in the field, where the risk of injury is high.

Purpose: The purpose of this study was to determinate the role of anthropometric selection in young football players.

Material and method: Our study includes 488 young football players aged from 12 to 18 years, who began to practice football at least 3 years prior to the study. Anthropometric evaluation (height, weight, body composition, physical qualities) were carried out on the occasion of their medical checkup in The National Institute of Sports Medicine during 2007.

Results: Studying the anthropometrical parameters at a total of 488 young football players, we found out that 52.66% are tall, 46.72% are of medium height and 0.6% are under the average. Regarding the weight, 54.7% are under weight, 18% are of normal weight and 25% are overweight. Analyzing the body composition shows that 55.94% have a proper lean body mass, 26.63% have up to 2 kg less lean body mass and 17.41% have over 2 kg deficit of lean body mass. Concerning the adipose tissue, 46.92% of the subjects have appropriate percentiles, 42.62% presenting up to 2 kg more body fat and 10.45% exceed the standards with more than 2 kg. We found out that 20.49% of the subjects are in the optimum recommended body weight but from them as a whole only 78% have a proper lean body mass. Of the total number of 488 cases, 14.55% are over weight by a large muscle bulk presenting low/normal level of body fat.

Conclusions: The growth status and the physical development, the body composition and the optimum body weight should be closely monitored in young football players. A rigorous secondary selection is necessary after 3-4 years of football practice. Values close to the anthropometric criteria are favorable for obtaining performance.

Key words: Body weight. Football players. Anthropometric.

Factors of risk for academics from physical education

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The physical educator has between others duties teach the society about the benefits which come from physics activities and the positive relation of these benefits with a healthy life. Often this kind of professional is seen as a model for the people through his healthy way of life, either his healthy advices. In this sense we pretend, with this search to verify the factors of risks for academics beginners who do start in the first period of the Course to be Physical Education Graduated. This project has been approved by Ethic's Committee of Dom Bosco College, and were evaluated 69 academics from Dom Bosco College. They were divided by 30 women from 22,0 ± 5,17 years and 39 men from 23,1 ± 6,30 years. In addition the way used to verify the incidence of physics activities, tabacco and antecedents in the family who had some kind of Chronic Degenerative Disease (CDD) we used some questions. To Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) we used digital monitor of pressure. The Body Mass Index (BMI) was calculated through body mass divided by stature raised to the power of two. Using perimeters of both waist and hip was found the Waist Hip measurement Relation (WHR). To estimate the percentage of body fat (%BF), Siri's (1961) equation and was used Guedes e Guedes (1991) protocol with three fold to calculate the body density. To provide data treatments the way chosen was through descriptive analysis average and standard deviation of varies. The non active population accounted for 27%. The number of smokers accounted for 7% and 71% reassured to have incidence of CDD in their family. The women showed SBP around 120 ± 10 mmHg and DBP around 78 ± 9 mmHg. Between the men it raised up to 128 ± 12 mmHg and 81 ± 10 mmHg. The average of BMI found in women was 21,74 ± 2,17 Kg/m². The WHR 0,72 ± 0,06 and %BF 25,98 ± 4,14%. In the male population the BMI found was 23,20 ± 2,56 Kg/m² and 0,83 ± 0,07 talking about WHR, and a %BF of 17,71 ± 5,74 %. According to ACMS (2003), the values of SBP, DBP, BMI and %BF showed in this search are normal and WHR found represent a moderated risk for both men and women. In conclusion we can reassure that the facts of healthy risks had a low percentual. Same finding CDC at the familiar historical of the appraised, the results of the our protocol were into of the normality standard.

Key words: Body mass index. Risk factors. Physical educator.

Prevalence of overweight and obesity in children of both genders from 6 to 10 years of age. A study in the county of Amarante, north of Portugal

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The aim of the study was to investigate the prevalence of overweight and obesity in children, and its relationship with age and gender.

A stratified and proportional sample of 2803 children of both sexes aged 6 to 10 years residing in the county of Amarante, located in the north of Portugal was used in this study. Weight was measured with a Philips Electronic Scale - HP5325 and height with stadiometer. Body Mass Index was computed from height and weight. Overweight and obesity prevalences were computed based on Cole et al (2000) cut-off values. Quality control of measurements was performed with the intraclass correlation coefficient (R). R values for data reliability were very high in females (R = 0.998) and males (R = 0.999) supporting the quality of all measurements. All statistical calculations were done in SPSS 12.0 and SYSTAT 11.

In females the prevalence (P) of overweight is highly variable, ranging from 10.1% to 19.3%. The highest prevalence was found at 9 years (P=19.3%; 95% CI=15.2; 23.8) and the lowest at 10 years (P=10.1%; 95% CI=4.9; 16.8); in boys the highest value was found at 8 years (P=17.9%; 95% CI=13.8; 22.5). Obesity showed low prevalences, with values ranging from 4.1% to 7.2%. The highest prevalence was found at 8 years (P=6.6%; 95% CI=4.1; 9.7). Across each age, sex differences in joint values of overweight and obesity were only found at 6 years (z=1.91, p=0.056).

It was concluded that the prevalence of overweight and obesity of Amarante children is lower than that recorded in different places of the country and abroad. However, it is important to provide constant surveillance in this Pediatric population since together, overweight and obesity affect, approximately, 1/5 of this population.

Key words: Overweight. Obesity. Children.

High performance Spanish athletes body composition estimation

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The aim of this work is to present the anthropometric data of a large sample of athletes collected from 1990 to 2008 at the Olympic Training Center of Sant Cugat del Vallès (CAR), to contribute to somatic references of elite Spanish athletes.

Rules and technique used are recommended by the "International Working Group of Kinanthropometry" (Ross & Marfell-Jones, 1982), proposed by "International Society for the Advancement of Kinanthropometry" (ISAK) and by the "Grupo Español de Cineantropometría (GREC)".

We have carried out 3475 anthropometries, 2294 males ($21,3 \pm 4,9$ years) and 1181 females ($19,7 \pm 4,2$ years) corresponding to 30 different sports. For the analysis we have selected those sports where the sample is representative, by the sample size or by his homogeneity and organized by sport and category.

All necessary anthropometrics measurements were used to calculate body mass index (BMI), somatotype (Heath Carter), \sum 6 skinfolds and percentage of fat (Yuhasz, Faulkner, Drinkwater). The data were expressed as means \pm SE.

In the next graphic and table, we present some results of somatotype for athletics (Figure 1).

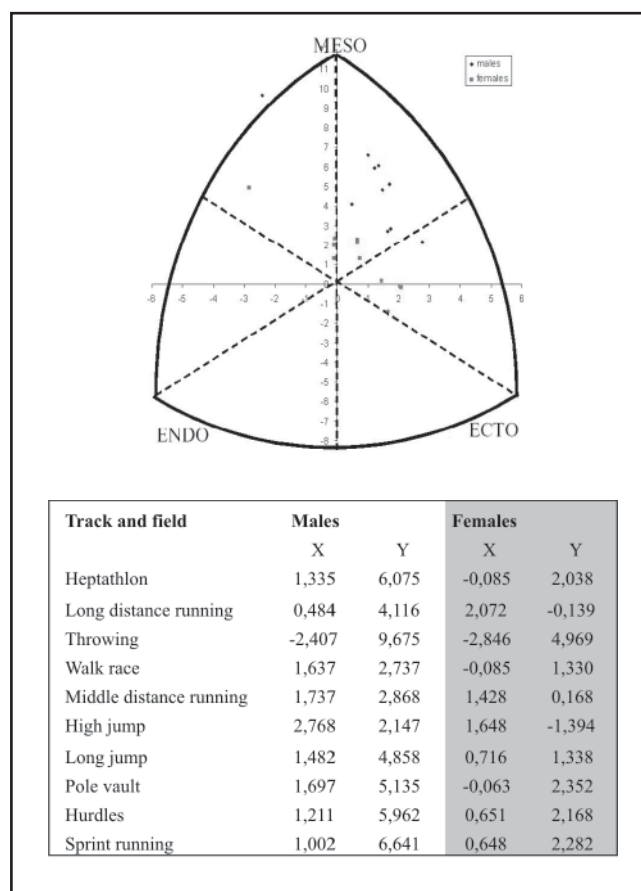


Figure 1. Pons V, et al.

We conclude that kinanthropometry data provides a clear appraisal of structural status at any given time, for quantification of different sports modalities and training influences. The knowledge of kinanthropometry normative data of elite athletes is a useful and necessary information for the professionals sports.

Key words: Spanish athletes. Body composition. Somatotype.

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-I

Programmed-exercise effects on plasma oxidative stress and haemostatic indices in an experimental model of metabolic-syndrome

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The metabolic syndrome (MetS) is a complex clinical entity frequently linked to obesity that is characterized by the co-occurrence of a variety of metabolic and cardiovascular dysfunctions that are risk factors for type 2 diabetes mellitus and cardiovascular disease. Changes in life style habits, including programmed physical exercise are considered beneficial to overcome obesity and to ameliorate the risk factors associated with the MetS. Oxidative stress is a relevant factor involved in the pathogenesis of diabetes and cardiovascular complications of the MetS. Plasma fibrinogen concentration, a haemostatic index frequently increased in obese patients, has also been associated with insulin resistance and type 2 diabetes. We have investigated the effects of adhering to an exercise programme of treadmill running (EPTR) on a variety of somatic indices and plasma oxidative stress and haemostatic markers in the adult Obese Zucker (OZ)-rat model of MetS. Adherence to the EPTR reduced body weight (BW) and increased heart- and skeletal muscle-to-body weight ratios without reducing liver, kidney or fat weight in a statistically significant manner. Chronically exercised animals displayed reduced plasma levels of protein-bound TBARS (adducts with malondialdehyde and other lipid peroxidation products reacting with thiobarbituric acid). Glycated proteins tended to increase following a single exercise-bout (EB) in sedentary but were reduced in animals adhering to the EPTR after the EB. Fibrinogen showed a trend to decrease following programmed exercise, approaching lean Zucker (LR)-rat levels. Glycation of proteins correlated directly with kidney (0.639 , $p < 0.001$) and liver (0.419 , $p = 0.024$) weight and inversely with insulin levels (-0.512 , $p = 0.004$). Plasma protein-bound TBARS correlated inversely with glycemia (-0.550 , $p = 0.001$) and plasma fibrinogen with leptin (-0.596 , $p < 0.0001$) and soleus (-0.382 , $p = 0.034$) and EDL (-0.369 , $p = 0.041$) -to-body weight ratios. The data highlight the close relationship between oxidative modification of proteins and plasma glucose and insulin levels and between fibrinogen and leptin and muscle atrophy (Figures 1 and 2).

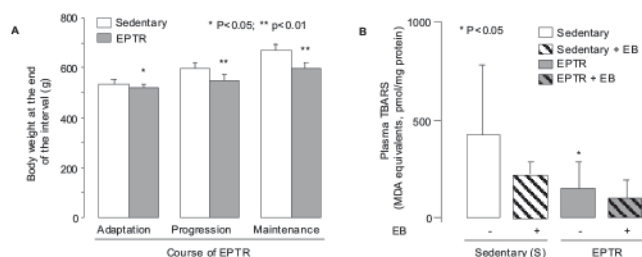


Figure 1. Condezo, et al.

Financed by the "Plan Nacional de Investigación Científica, Desarrollo e Innovación Tecnológica 2004-2007, Acción Estratégica sobre Deporte y Actividad Física (DEP2006-56187-C04)" from the Ministry of Education and Science, Spain.

Key words: Metabolic syndrome. Oxidative stress. Programmed exercise.

Case report: Acute pseudoaneurysm of femoral artery after repeated trauma in full-contact karate practice

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Traumatic pseudoaneurysms of the deep femoral artery are encountered only infrequently in sports medical literature. Traumatic pseudoaneurysm during the practice of sport is an infrequent event. Normally it is produced by the interruption of the arterial flow with extravasations of blood to the peripheral tissues, independent of the process which initiated it: surgery, trauma, infection, vasculitis or interventionist percutaneous procedures. The majority of cases described in literature refer to false aneurysms in other locations such as the temporal artery, carotid artery, digital artery etc. In all of these cases the result is the formation of a fibrous capsule which spreads out in a progressive manner due to the constant arterial pressure in the area. The diagnosis is normally clinical, supported by radiological scans, with the Doppler ultrasound as the tool which brings information about the location and morphology of the aneurysm. The arteriography is necessary before surgery or endovascular treatment. Whilst not producing significant mortality, this process does generate an important injury effect in sportspeople.

We present the case of a male who, after practising full contact karate, experienced pain and oedema in the right thigh. The ultrasound results and the arteriography showed the presence of a pseudoaneurysm in a branch of the deep femoral artery. Traumatic pseudoaneurysms of the deep femoral artery are normally secondary to endovascular interventions, or to mycotic infections in drug addicts through intravenous injections. The majority appear asymptotically as a pulsatile mass, although on occasions clinical signs of compression (pain, neurological or venous symptoms) may appear, or, if the aneurysm bursts, of hypovolemic shock.

Key words: False aneurysm. Athletic Injuries. Embolization.

The importance of massage and kinetic therapy for the stress lumbar pain recovery at sportsmen

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Introduction: The stress lumbar pain produced by the excessive solicitations is frequent in the sportive activities and can determine physical, psychological discomfort and the decrease of athletics' performances.

Objective: The purpose of our work is to emphasize the massage and kinetic therapy role as part of an intensive recovery programme for sportsmen with low back and sacral pain syndrome produced by excessive solicitations (non traumatic).

Material and method: The study was made in the period September 2007 - June 2008 at the Sport Polyclinic from Craiova, on a lot of 10 sportsmen (8 boys and 2 girls), with an average age of 19,5 years, diagnosed after clinical, paraclinical (laboratory tests and radiological exam) and functional evaluation with lumbar and sacral pain syndrome.

We used the analog visual scale (VAS) for pain and low back pain (LBP) scale for quality life appreciation.

The patients were evaluated at the beginning (T1) and after 15 days (T2) of an individualized recovery programme, that included (non inflammation and muscular relaxation medication, profound transversal Cyriax massage (5 minutes a day, three times a week), this massage was preceded by Wetterwald exercises (5 minutes a day, two times a week), electrotherapy and kinetic therapy (stretching and recovery muscular force exercises).

Results: At the studied sportsmen, the pain and spine functional status evolution was favorable, the VAS and LBP scores improved with 48% (T1), respectively 65% (T2).

Conclusions: The used massage techniques reduced pain, produced muscular relaxation and local circulation stimulation, decrease the adipose deposits and intensified the effect of the other used therapeutic methods.

Key words: Stress lumbar pain. Massage. Kinetic therapy.

Pilot study: quality life in musculoskeletal disorders to submit a community-based physical exercise program

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Introduction: The quality of life (QoL) is often diminished by the suffering of musculoskeletal disorders. Physical exercise is presented as a good option for dealing with this problem, although the design and supervision of a therapeutic

exercise program would increase its effect.

Object: To evaluate the changes that this program brings in the QoL of these patients.

Materials and methods: A prospective study of a single group (n =31) which compares the QoL of individual patients with musculoskeletal disorders using the EuroQol 5-D questionnaire (EQ5D) and visual analogue scale (EQ-VAS) after a intervention with a therapeutic exercise program supplemented with health education for eight weeks.

With the SPSS 15.0 program we made an analysis of the distribution by the TStudent for parametric and for non parametric variables was used the signed rank Wilcoxon test.

Results: The variables EQ - VAS presents a normal distribution unlike the rest of variables. We have found significant differences in the post-intervention EQ-VAS with a means difference of -9.10±15.23 {IC 95% -14.68 to -3.57} with a bilateral significance of 0,002 in the TStudent. In parametric Wilcoxon tests have shown significant differences in the variables pain and discomfort (p = 0,005) and the trial of EQ5D (p = 0,034). Other variables have shown no significant differences.

Conclusions: As in other authors, we have found in the variables that are probably more significant (trial QoL and pain and discomfort), there is a significant difference between pre and post - survey was not so in the rest of variables.

This study presents the following limits: lack of statistical power and level design has small internal validity because it is a non-randomized study without control group. It would be necessary studies and randomized controlled design with higher statistical power.

Key words: Therapeutic exercise. Musculoskeletal disorders. Quality of life.

Muscular electrical stimulation training reduces physiological tremor in patients with hemophilia A

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Introduction: Tremor, considered an intrinsic property of the normal behavior of the motor system, has been defined as a series of quick alternating involuntary rhythmic movements of one or several parts of the body (Takanokura & Sakamoto, 2005). It can be influenced by hemophilia and other pathologies that affect the proper functioning of the motor system. The purpose of this study was to determine the effect of Muscular Electrical Stimulation (MES) training on physiological tremor in patients with hemophilia A.

Material and methods: Nine patients with severe hemophilia A volunteered to take part in this study. They were involved in a training that consisted of 24 sessions (8 weeks) of surface and bilateral MES on biceps brachii (45 Hz, 200 µs, 10 s on/10 s off). Before and after training, a 6.5 g accelerometer (K-Beam 8305A, Kistler, Amherst, USA) was used to assess the physiological tremor of both arms while the subject maintained an elbow flexion of 1.57 rad with hand pronation. The accelerometer was placed with double-sided tape on the 3rd phalange of the 3rd finger. Two trials of 10 s were performed in a seated position.

Tremor amplitude in the time domain were quantified by means of the root mean square, and processed every 100 ms. The Wilcoxon test was performed to compare the mean amplitudes obtained before (Pre) and after (Post) training.

Results: Table 1 shows the physiological tremor amplitudes.

Conclusions: MES significantly reduced physiological tremor (19.34%, p<0.05). Based on this result, we believe it may help patients with hemophilia A to perform fine motor tasks.

Key words: Tremor. Haemophilia. Strength.

Table 1. Gomis M, et al. Physiological tremor amplitudes of the hands (n=18)

Measurements	Average	SD	Minimum	Maximum
Pre-1	2.09	0.18	0.86	3.42
Pre-2	2.15	0.22	0.78	4.48
Post-1	1.70*	0.12	0.97	2.89
Post-2	1.72*	0.14	0.89	3.20

Root mean square of the acceleration amplitudes (mV). Asterisk indicates a significant difference between Pre and Post training (p<0.05).

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-II

Exercise training and inflammatory systemic response in an animal model with metabolic syndrome (Zucker rats)

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Introduction: Metabolic Syndrome (MS) is associated with obesity, and involves risk factors for diabetes mellitus type II and arteriosclerosis. The arteriosclerosis associated with MS is due in part to inflammatory processes. The aim of the present work was to evaluate the effect of an exercise training protocol on the inflammatory response in obese Zucker rats, a good experimental animal model to study the MS.

Methods: Obese Zucker rats (n=40) were divided into 4 experimental groups (n=10): sedentary rats (S), sedentary rats that performed a single bout of exercise (SE) (running on a treadmill for 35 minutes at 35 cm/min), trained rats (T) (running for 35 minutes at 35 cm/min for 16 weeks, 5 days per week), and trained rats that performed a single bout of exercise (TE). In each experimental group various "inflammatory markers" were evaluated: interleukin (IL) 1 β , IL-6, and C-reactive protein (CRP). Norepinephrine (NE) was also determined to evaluate the stress levels induced by the exercise. Interleukin and CRP serum concentrations were determined by ELISA, and NE plasma concentration by HPLC.

Result: All the groups subjected to exercise showed higher CRP and NE levels than the sedentary group. Acute exercise increased CRP and NE concentration only in the absence of previous training (SE vs S), with no differences found in trained animals (TE vs T). IL-1 β and IL-6 concentrations also showed both exercise induced changes and an adaptation to the training, but only with statistical significance for IL-6. Thus, exercise training induced a significant increase in IL-6 concentration (T vs S) and the acute exercise increased IL-6 concentration in sedentary (SE vs S) but not in trained rats.

Conclusion: This exercise training model induces stress in obese Zucker rats that may exacerbate their increased inflammatory status (IL-1 β , IL-6, and CRP). Nevertheless, the evaluated training program generated an immunophysiological adaptation in these rats in response to a single bout of acute exercise.

This work was partially supported by grants DEP2006-56187-C04-03 (M.E.C.) and GRU08039 (Junta de Extremadura), and fellow supported by Fundación Valhondo de Extremadura, Spain.

Key words: Inflammation. Obesity. Training.

Aquatic exercise training therapy improves inflammatory markers (IFN- γ and IL-8) in fibromyalgia patients

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Introduction: Fibromyalgia is a syndrome characterized by widespread chronic pain. Cytokines seem to play a role in its pathogenesis. Previous studies in our laboratory in healthy women have shown that moderate exercise promotes a good balance between pro- and anti-inflammatory cytokines, which is crucial to avoid autoimmune and/or inflammatory diseases. Also, aquatic exercise therapy seems to improve pain management in fibromyalgia patients. Given this context, the aim of this study was to evaluate the effects of an aquatic exercise program on the systemic release of pro- and anti-inflammatory cytokines during the training program. In parallel, we determined possible differences in the cytokine concentrations between fibromyalgia patients and healthy control women.

Methods: The study sample comprised women diagnosed with fibromyalgia (F, age range 32-67, n=13). This group took part in an aquatic fitness program over a period of eight months. The training program consisted of three weekly 60-minute sessions. The exercise sessions were carried out in an indoor swimming pool (depth 1.1 m, mean water temperature 30.0°C), and were performed as follows: stretching exercises out of the water, aerobic warm-up in the water,

passive stretching of the main muscle groups in the water, aquatic choreography, strength exercises involving the main muscle groups, cool down. IL-1 β , IL-2, IFN- γ , TNF- α , IL-8, IL-6, IL-10 and IL-4 were determined (ELISA) in their basal status (and then compared with basal levels in healthy women aged 25-50), midway through (4 months) and at the end of the program (8 months).

Results: The only pro-inflammatory cytokines clearly involved in the fibromyalgia syndrome seemed to be IL-8 and IFN- γ . Thus, 100% of the F group women (vs 15% of the healthy controls) showed higher serum concentrations of IL-8 than the expected values in healthy people (<29 pg/ml), and 40% of the F group showed higher values (10-319 pg/ml) of IFN- γ than the expected values in healthy people (< 5 pg/ml). Midway through the 8 months of aquatic training, both IFN- γ and IL-8 had clearly decreased concentrations (with "healthy values" in the case of IL-8). At the end of the training program, however, IFN- γ showed its lowest values, whereas IL-8 had risen to its highest ones.

Conclusion: 4 months of the aquatic training protocol evaluated clearly improved the levels of IFN- γ and IL-8 in patients with fibromyalgia. However, 8 months only seemed to be beneficial to reducing IFN- γ levels.

This work was partially supported by grants PRI 06A172 (Junta de Extremadura) and GRU08039, and by a studentship from the Junta de Extremadura, Spain. We also thank Aquarecord Wellnes Center and Don Benito Town Hall for their collaboration.

Key words: Fibromyalgia. Cytokines. Aquatic exercise therapy.

Biochemical values in haemophiliacs undergoing training

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Introduction: Of all the recommended sports, swimming appears to be the most suited for haemophiliacs. In general, an overall medical check-up, and even a blood test, is recommended to anyone who wishes to start a training programme. The aim of this work is to quantify the analytical alterations produced in the laboratory after following an aquatic training protocol, one especially adapted to patients with Haemophilia A. For this purpose, different biochemical parameters to those normally requested were studied in these high-risk patients, e.g., coagulation tests.

Material and methods: 10 haemophiliacs (mild, moderate and severe) underwent 27 training sessions: 3 days/week on alternate days for 1 hour. Blood samples were taken on the first and last days of the training programme. Once the data had been collected, a statistical study with an ANOVA of repeated measurements and a multiple pairs comparison of the least significant difference were done.

Results: Some of the data obtained are summarised in Table 1. This haemophiliacs population has muscle trouble, hepatic tissue necrosis, hepatitis, cholecystitis, liver infections, cirrhosis, etc. This study looked at how this training could affect the underlying illnesses from which our study samples derived. No significant differences were found among the parameters either before or after training.

Table 1. García Lucerga C, et al. Comparison of haemograms and the biochemical values (n=10)

	Before	After
Glucose (mg/dL)	82.80 \pm 19.58	77.80 \pm 10.21
Leucocytes (mil/mm ³)	5.93 \pm 2.40	5.82 \pm 2.95
Eosinophils (%)	2.28 \pm 1.43	2.39 \pm 1.15
Haematins (mil/mm ³)	4.88 \pm 0.52	4.78 \pm 0.49
Hb (g/dl)	15.23 \pm 1.82	15.05 \pm 1.15
Platelets (mil/mm ³)	176.00 \pm 75.09	206.90 \pm 83.79
Cholesterol / HDL (mg/dL)	3.91 \pm 1.08	4.07 \pm 1.37
Triglycerides (mg/dL)	110.00 \pm 72.84	119.90 \pm 78.90
Total bilirubin (mg/dL)	1.15 \pm 0.81	1.10 \pm 0.62
Iron mg/dL	92.00 \pm 50,89	76.90 \pm 23.03

The data are means \pm standard deviations

Conclusions: During the 9 weeks that the training lasted, no changes were noted in their hepatosplenic troubles, infections; these subjects are a population at cardiovascular risk, with a normal atherogenicity index.

Key words: Biochemical values. Haemophilia. Aquatic training.

A biomechanical study of standing long jump among persons with autism and Down syndrome

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Background: In recent years, the physical exercise for persons with disabilities is of significant interest. The purpose of this study is to evaluate the standing long jump among persons with autism and down syndrome in the biomechanical analysis.

Methods: Nineteen autism persons (autism group; aged 10-36) and 9 down syndrome persons (down group; aged 10- 25) participated in this study. The two kinds of standing long jump (a fixed both arms jump and a free styled jump) were performed and monitored by the two video cameras. The length of standing long jump was measured and the load distribution was analysed by foot-scan. Statistical analysis of the data was performed using t'test.

Results: In the length of both styled standing long jumps, there was not significant difference between autism group and down group. The value of the maximum load by both styled jumps in autism group was significantly higher than that in down group ($p < 0.05$). In autism group, the time to the the maximum load by a fixed both arms jump is significantly shorter than that by a free styled jump ($p < 0.05$). However, in down group, there was not significant difference in the time to the maximum load between a fixed both arms jump and a free styled jump.

Discussion: From the biomechanical analysis, the results showed that persons with autism have different patterns of standing long jump from persons with Down syndrome. Furthermore, the performance may also be influenced by the jumping style, especially in persons with autism.

Key words: Autism. Down syndrome. Long jump.

Therapeutic use of physical activity in acute psychiatric patients and clinical psychology

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In the last years the Physical Activity has known a remarkable development in educational and re educational fields; its application in therapeutic field has been considered important too, because it allows to make forehead to a great range of psychiatric illnesses in which it is evident a disordered knowledge of himself, of the others and a disordered body-consciousness.

Our hypothesis is that, intervening in the body's consciousness of the psychiatric patients, we could reinforce the disease knowledge, improving consequently also the compliance and aggressive behaviour.

The aim of the present research is the evaluation of the physical activity's effects, applied on 39 acute hospitalized psychiatric patients. The patients have been divided in two groups, using a random methodology, and submitted one group (on an experimental treatment (physical activity, pharmacologic-therapy and supporting psychotherapy = GROUP A) and the other one on a traditional treatment (pharmacologic-therapy and supporting psychotherapy = GROUP B).

These two groups, blind-observed by the experimenters equipments, have been evaluated comparing some factors of clinical outcome, which are: the insight, the compliance and the aggressive-behaviour grade.

The results indicate that the Physical Activity in acute hospitalized psychiatric patients, seems to favourite the insight and the compliance and to decrease the aggressive behaviour in meaningful way.

Key words: Insight. Compliance. Aggressive-behaviour.

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-III

Effect of a bout of exercise in several immune functions in obese Zucker rats

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Obesity is one of the most common diseases in developed countries, and is associated with some degree of inflammation of adipose tissue and an impairment of several immune functions. Actually, the physical activity is a way of preventing the effects of obesity and several studies have shown the effects of physical exercise enhancing the immune response. The aim of this work was to study in a murine model of obesity, the effects of a bout of exercise on several key immune functions.

Male obese Zucker rats of 6 months of age were used. The animals were divided in two groups: sedentary and submitted to a bout of exercise (running in the treadmill during 30 minutes). The animals were sacrificed after the exercise, and paralelly the controls, and plasma and spleen leukocytes were obtained. The functions analyzed were: proliferative response to the mitogens Lypopolysaccharide (LPS) ($1 \mu\text{g/ml}$) and Phytohemaglutinine (PHA) ($25 \mu\text{g/ml}$); Natural Killer (NK) activity against murine tumoural cells, and TNF α release in presence of LPS in spleen leukocytes, and the levels of total antioxidants in plasma.

The results show that the lymphoproliferative response to LPS and the TNF α levels were decreased in exercised rats with respect to the sedentary animals. However, the NK activity and the proliferative response to PHA did not show any changes. Even though the antioxidant levels in plasma in Zucker rats are abnormally high with respect to other rat strains such as Wistar, we were able to detect that bout exercise tend to lower this values when comparing with the levels in sedentary animals.

Thus, a bout of exercise in obese Zucker rats is not useful for improving their immune status. Moreover, the impairment of the immune function caused by this kind of exercise could decrease the capacity of these rats to cope with infections.

Key words: Physical exercise. Immunity. Obesity.

Effect of training exercise in lymphoproliferation and natural killer activity in obese Zucker rats

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Obesity is associated with an impairment of the humoral and cellular immunity. The evidence of the effectiveness of moderate and regular physical activity for improving the immune system is increasing, although the effect of exercise on immune response depends upon the type of exercise, its intensity and the physiological conditions of the subject. Since the studies regarding the effects of exercise on the immune status of obese animals are scarce, the aim of the present study was to evaluate, in a murine model of genetic obesity, the effects of a moderate short-term training and a bout of exercise on several immune functions.

Male obese Zucker rats were divided in three groups: sedentary, submitted to moderate training (1 daily treadmill-running session for 16 consecutive weeks; treadmill speed and duration time of sessions increased gradually) and submitted, after the same moderate training, to a bout of exercise (treadmill-running during 30 minutes). The animals were sacrificed at the age of 6 months and in the spleen leukocytes the following functions were analyzed: lymphoproliferative response to the mitogens Lypopolysaccharide (LPS) ($1 \mu\text{g/ml}$) and Phytohemaglutinine (PHA) ($25 \mu\text{g/ml}$); TNF α release and Natural Killer (NK) activity.

The results show that the lymphoproliferation in response to both mitogens decreased in trained rats with respect to sedentary animals. No changes were observed in NK activity and TNF α levels. Concerning the bout of exercise, the NK activity decreased and the lymphoproliferation to PHA increased with respect to trained animals; and the other parameters were not modified.

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Although an enhancement of some immune parameters after long-term exercise treatments (40 weeks) in obese Zucker rats has been described, the shorter training period performed in the present work was not long enough to improve the immune status in those animals.

Key words: Obesity. Training. Immune system.

Sport and haemophilia: basic recommendations to prevent arthropathy

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Introduction: Haemophilia is a haemorrhaging disease which implies very serious musculoskeletal alterations (e.g., haemophilic arthropathy). Treatment in terms of coagulation and physiotherapy is based on substitution factor therapy. In developed nations, the "Prophylaxis" therapy has improved the haemophilic's quality of life considerably, thus lowering the frequency of haemorrhaging and, consequently, the degenerative process of joints. Prophylaxis implies physical activity and sport. The aim of this work is to describe our protocol in relation to the recommendations for preventing arthropathy.

Material and methods: We reviewed 312 haemophiliacs: 97 severe cases, 56 moderate cases and 159 mild cases. A first phase involved organising courses for severe patients who were divided into 3 groups: children, young adults and adults. The programme included clinical examination and radiology, a basic information course on haemophilia, and recommendations about physical activity and sport. With young adults, tests on physical condition were assessed, while a subgroup of young adults did a programme of water activities under physiotherapeutic supervision. The basic protocol to treat any sport lesion involves early administration of factor VIII/IX. However, immediate action is summarised as RICE: R= Rest (joint immobilisation); I= Ice; C= Compression; E= Elevation.

Results: Swimming is the main sport recommended in our protocol. All our patients received instructions about practising this sport and they have occasionally been to courses whose instructors are knowledgeable about haemophilia-related problems. The subgroup of young adults who took part in the controlled swimming model have noticed significant improvement in their physical condition. All the patients and their families received instructions for the physical activity models, maintaining a full range of joint motion and muscle strengthening. The degree of substitution factor therapy fulfillment has been accurately recorded. The clinical and radiology scores recommended by the WFH enabled us to assess arthropathy but not the degree of fulfillment of the physiotherapeutic models.

Conclusions: Treating haemophiliacs requires special care in terms of physical activity and sport. Physiotherapy protocols form part of the prophylaxis and are generally recommended, but their degree of fulfillment is difficult to assess. Swimming forms part of currently prescribed models and its efficacy has been clearly demonstrated as far as physical conditions are concerned.

Physical exercise programme in the treatment of chronic fatigue syndrome

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Physical exercise is considered one of the treatments for patients with Chronic Fatigue Syndrome (CFS), pathology with an unknown etiology. The major symptoms characteristic is an intense and unexplained fatigue which a high incapacity for the normal life. Nowadays, there is still no treatment for this illness. The experts are working on reducing the symptoms, using different multidisciplinary treatments. Physical exercise is an important possibility for these patients. The aim of this study tried to carry out a physical exercise program to improve functional capacity and that the patients could be useful this physical exercise program for himself to increase their quality of life.

Twenty CFS patients (19 women and 1 man; 47.6± 6.3 years) participated in this study. All patients performed a maximal physical test on cycleergometer, and, after, performed a six-week exercise program (thirty-six sessions). The program was designed to stimulate their cardiovascular system, as well as other physical features (strength, range of movement...) and skills like balance or coordination. A 55% of

the patients finished the exercise program. They repeated the maximal physical test on cycleergometer. VO₂ consumption maximal peak increased 7.0% and maximal work capacity increased 18.5% with a statistical significance in the second test. And when the intensity was supramaximum, work capacity increased too. At the end of these six weeks, VO₂ max improved, as well as work capacity. Therefore, it seems that practising physical exercise on a regular basis can improve functional capacity.

Key words: Chronic fatigue syndrome. Physical exercise. Fatigue. VO₂peak. Work capacity.

Familiar intervention -Programa Nereu- to promote physical activity behaviour in sedentary overweight children and adolescents

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The aim of this study was to assess the contribution of a familiar intervention (Programa Nereu) for the promotion of physical activity behaviour in sedentary overweight children and adolescents aged from 8 to 14 years and their families. Eighteen children and adolescents took part on a supervised physical activity program that lasted 9 months (3 sessions of one hour per week). Their parents attended to physical activity and diet counselling sessions (21 sessions). Before and after the program, daily physical activity behaviour of children and adolescent (n=10) was assessed by means of seven-day recall questionnaire.

Results show that at the beginning of the program, participants devoted 39,8% of the weekly time to sleep; 47,5% to sedentary physical activities (<1,5 METS); and only a 1,6% to moderate (3 to 4,9 METS) and 2,5% to heavy (>5 METS) physical activities. At the end of the program, participants stated to spend more time to heavy physical activities (+ 3,5; IC95%: 2,4 to 4,7 h•week⁻¹) (p<0,05) and less time to sedentary activities (-5,9; IC95%: de -9,3 a -2,6 h•week⁻¹) (p<0,05). The reduction could be attributed in part to a decline of the time dedicated to video-computer games (-2,8; IC95%: de -5,3 a 0,2 h•week⁻¹). Time devoted to TV watching tended to decrease but changes were not significant.

Even with the lessening of time dedicated to sedentary activities, participants spend a great number of hours to TV or video-computer games: 23,6 and 18 hours•week⁻¹ at the beginning and at the end of the program, respectively. However, time devoted to these sedentary activities still exceeds the recommended 7 to 14 hours per week.

The primary goal for the management of children obesity is to improve eating and physical activity habits, and not simply targeting an ideal body weight. Childhood is a critical period for adopting healthy conducts that will persist in adulthood. Nevertheless, this is not an easy task, as results in the present study indicate (Figure 1).

Key words: Familiar intervention. Physical activity behaviour. Overweight.

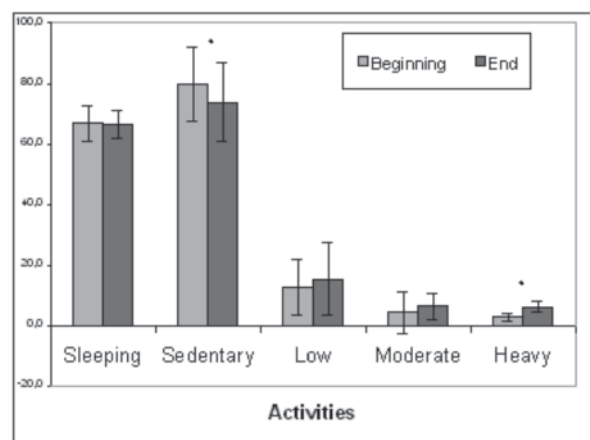


Figure 1. Sellés M, et al. Weekly hours devoted to different actions in all participants (n=10) at the beginning and at the end of the program. * Indicates statistically significant differences (p<0,05)

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-IV

Effects of a functional strength training program in women with chronic low back pain

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Introduction: Therapies through physical exercise have a crucial role within the different strategies for treatment of low back pain. However, at the moment, incorporating new trends in the prescription of physical activity for improving health-related to quality of life of those unknown effect on this kind of population. The objective of this study is to evaluate the effects of functional strength training in functional disability and intensity of pain in women with chronic low-back pain.

Material and methods: Patients with chronic low back pain for more time than 8 weeks and less than 6 months were included. A total of 19 women were randomized to either exercise (n = 11) or to control (n = 8). 36 exercise sessions were given over the course of 3 months. Pain intensity (Visual Analogue Scale 0-10), and functional disability (Oswestry Disability Index) were recorded before and immediately after the treatment period.

Results: The exercise group showed significantly larger improvements than the control group on all outcome variables throughout the entire experimental period. Immediately after 3-month treatment period, 61,1% and 61,25% in the exercise group and 3,4% and 2,6% in the control group had reduced its functional disability and intensity of pain respectively (p<0,001). Were showed clinically important differences between-group on function and pain.

Conclusion: The functional strength training, progressive and custom, has changed really significant and clinically important levels of functional disability and intensity of pain in young women with chronic low back pain whose disability is between minimal and moderate.

Key words: Low back pain. Exercise. Function.

Level of physical activity, energy expenditure and pain in women with chronic low back pain

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Introduction: People with chronic low-back pain usually have functional disability due to pain. This circumstance could cause actual levels of physical activity and thus energy expenditure is negatively affected. The aim of this study is to check the levels of physical activity and energy expenditure depending on the intensity of the pain.

Material y methods: Patients with chronic low back pain for more time than 8 weeks and less than 6 months were included. A total of 19 women were randomized to either exercise (n = 11) or to control (n = 8). 36 exercise sessions were given over the course of 3 months. Pain intensity (visual analogue scale 0-10), level of physical activity and energy expenditure (International Physical Activity Questionnaire (IPAQ)) were recorded before and immediately after the treatment period.

Results: The control group experienced no significant change after the intervention. The experimental group, whose pain intensity had been reduced significantly (p<0,001), increased (p<0,05) 1,36 d·sem⁻¹ the frequency, 149,1 min/week the duration and 2218,18 METs·min/week energy expenditure derived from physical activities vigorous (8 METs). In moderate activities (4 METs) increased (p<0,05) the duration in 59,09 min/week and weekly reduced the time that remained seated 166,36 min (p<0,05). The total weekly energy expenditure increased 2218,85 METs·min/week (p<0,05).

Conclusion: The decrease in pain intensity by a treatment of physical activity has been shown to have significant effects on increasing the frequency, duration and energy expenditure resulting from physical activities as well as in reducing the time that remained seated.

Key words: Low back pain. Physical activity. Energy expenditure.

Complex knee in jury in a mountain board athlete – case report

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Introduction: Articular lesions of the knee can be localized, or, more rarely, extremely large and involve multiple compartments of the knee joint. There are numerous causes for the development of these lesions, including joint injury, biomechanics and activities.

Methods: Male, 25 years-old, caucasian, physical education teacher and Mountain Board athlete since 2005 without previous lesions.

Admitted to Hospital de São Marcos – Braga, Portugal, in August 2008, for complex knee injury with patellar tendon and anterior cruciate ligament rupture, internal meniscal capsule and medial collateral ligament dissection.

Six days after hospital admission, he was submitted to surgical procedement with reinsertion of the internal meniscal capsule and medial collateral ligament with a grump, suture of the anterior cruciate ligament and a decompressive cerclage of the patella and tibial tuberosity.

Four weeks after the knee post-surgery immobilization, was initiated a rehabilitation program – thermotherapy, kinesiotherapy and electrical muscular stimulation.

Results: Two months after surgery and one month after beginning the rehabilitation program, increase of ROM, development of functional muscular strength and proprioceptivity. The authors pretend to present the patient clinical evolution (range of motion and straitening) and the reintegration on the professional activity with the physiatric treatment.

Conclusion: Athletes appear to be more susceptible to developing articular lesions than other individuals, which is specially true with some sports, like mountain board. The treatment for an athletic patient with articular lesions is often difficult and met with limited success. By the contrary, in the case of this patient, it appears that the evolution, until now, is favourable. Still, the best policy is pre sport conditioning and proper technique.

Key words: Complex. Articular. Rehabilitation.

Personal training for elderly people. What are we doing in a university sport center?

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Introduction: The Sport Service of Málaga University offers, in the aim of contributing to the specific quality service, different activities with elderly people. Healthy sport for older 55 is one of them. Medical examination before initiating it and working together sport physicians, physiotherapists and athletic trainers could increase health and social benefits.

Objective: Investigate the improve of the physical qualities in a group of people coming to a University Sport Service.

Methods: We studied 22 men and 36 women aged 44 -76 years participating in healthy activities for elderly people over a 12 months period. Divided into two groups (back school and therapeutic group). Each case was compared with its previous control at the beginning of the personal training activity. Information on exposure to risk factors was obtained by a structured questionnaire. Data were collected in our sport medical center (weight, height, body mass index, waist hip index, flexibility, lumbohorizontal and lumbovertical angle, blood pressure, resting heart rate) and tested: hand dynamometry, arms tapping, vertical and horizontal jump, ball launching, step test, speed and Ruffier test.

Results: Exercise therapeutic group blood pressure Men: 15,7 ± 1,4/ 8,6 ± 0,9; Women 13,3 ± 1,7/8,0 ± 0,2, Weight Mens:83,9 ± 0,8 Women 73,6 ± 9,7 Height Men 1,67 ± 0,01 Women 1,60 ± 0,10 Body mass index Men: 30,02 ± 0,05 Women 3 0 ± 7,5 waist hip index Men 1,0 4 ± 0,1 Women 0,70 ±,1 Ruffier Index Men 5,40 ± 1,5 Women 5,20 ± 6,3 Back school activity Men Blood pressure: 13,7 ± 2,3/ 8,1 ± 0,62 Women 12,5 ± 1,2/7,6 ± 0,67, Weight Men 86 ± 11,6 Women 66,2 ± 11,5, Height Men: 1,70 ± 0,08 Women 1,60 ± 0,07 Body mass index Men 29,1 ± 3,31 Women 25,63 ± 11,32 waist hip index Men 1,00 ± 0,05 Women 0,86 ± 0,07. Ruffier Index Men 9,8 ± 3,4, women 10,4 ± 4,6.

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Conclusion: Although no statistical differences were revealed in the investigation there is a hint that differences could be emerging in the best fitness group. Our results confirm the importance of group sport activities. Modifying risk factors may serve to reduce the risk of for example cardiological events and may also help to prevent. Specific programs are required to produce not only increases in movement ranges, flexibility but also may reduce blood pressure.

Key words: Healthy sport activity. Elderly people. Multidisciplinary work.

Sport and obesity: relations for a health lifetime since children sport initiation

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Sport is a social cultural phenomenon with multiple meanings attracting people around the world, bringing together more than 200 countries through the International Olympic Committee. Nowadays, this phenomenon gathers peoples, introduces brands, sells products and may be related to large financial events as much as to educational slant. At present obesity has also a global reach, being a disease that can be considered an epidemic of this early century. In this study, we propose that these two phenomena, sport and obesity, may be related especially since children sport initiation. If properly target anew offered since young ages, respecting the needs and biopsychosocial development stages, sport can be a practice that will accompany the individual during all lifetime and can work even for the control of obesity. However, processes of sport's initiation which early specialize children in activities and results similar to professional athletes tend to remove the child from the sport practice, what could be a factor of balance between calorie expenditure and consumption. Therefore, we propose process of children initiation in sport based on socio-educational values, looking at first the pleasure and the diversification of activities, helping to keep children in sport enjoying the practice benefits in a positive way. As a habit for lifetime, sport can be a way of integral development, contributing yet to control diseases linked to inactivity as obesity and others related to it.

Key words: Sport. Obesity. Childhood.

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-V

The Range of Motion (ROM) exercise load condition required for preventing joint contracture development

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Introduction: Generally recognized that the ROM exercises repeated five times and performed once a day for five days per week will prevent joint contracture development. We could not find evidence to the preventive effect of this ROM exercises load condition for preventing joint contracture development.

The objective of this study is to examine whether ROM exercises repeated five times and performed once a day for five days per week will prevent of joint contracture development.

Method: Wistar rats (male, 12w, 330-380g) were used in this study. All animals were fixed left knee joint at 90 degrees of flexion by means of unique external joint immobilization method. This method was used because the knee joint can freely and easily be immobilized and then removed of immobilization. These rats were randomly divided into the joint-immobilized group (JI group: n = 4) and the ROM exercise group (ROM group: n = 4). The ROM group had ROM exercise loaded five times and performed one set daily for five days per week. This was done for four weeks from the second week following the joint immobilized operation. The maximum torque loading for the ROM exercise was 0.049 Nm and its speed was 0.15 Hz. The proprietary equipment was used in torque loading.

Five weeks after the joint immobilization, the knee joint angle was measured at maximum flexion and extension (0.049Nm).

Results: The knee joint angle was 104.5 ± 5.0° (mean ± SD) before and 83.4 ± 8.2° after 5 weeks of the joint immobilization for the JI group. It was 101.7 ± 12.8° before and 78.0 ± 11.8° after 5 weeks of the joint immobilization for the ROM group.

Conclusions: These results suggest that the ROM exercises performed for five times once daily for five days per week can not prevent the development of joint contractures.

Key words: Prevent joint contracture. ROM exercises. Rat.

The study of functional and morphological changes on peripheral nerve in rat developed disuse atrophy

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Introduction: The purpose of this study was to investigate the motor nerve conduction velocity and changes of nerve tissue in disuse atrophy model on rats.

Methods: Male wister rats were used in this study. Animals were divided into Normal Control group (NC) and Hindlimb suspended group (HS). Disuse atrophy was induced in Animals of HS, by 2 weeks (2wk HS), 3 weeks (3wk HS), 8 weeks (8wk HS) of hindlimb suspension. On 13 weeks old of animals, MCV was recorded and removed sciatic and tibial nerves, and soleus muscle. Tissue specimens of sciatic and tibial nerves, and soleus muscle were observed using microscopy and electron microscopy.

Results: 1) MCV of all HS was lower than that of NC. 2) In 8 weeks HS, MCV and degeneration of tissue were the lowest of all HS. 3) We observed muscle atrophy in soleus in all HS group, and it is similar to atrophy of sciatic and tibial nerves. Moreover, we observed atrophy in extrafusal muscle fiber but not in intrafusal muscle fiber. 4) In cross and longitudinal sections of sciatic and tibial nerves, we observed atrophy of axon and degeneration of myelin sheath in all HS, and it coincided with depression of nerve function.

Conclusion: Disuse atrophy affected not only atrophy, adhesion and degeneration in muscle but depression of function and degeneration in nerve. And it was clear that degeneration of the nerve correlated with degeneration of the muscle. It could be thought that depression of nerve function was caused by degeneration of the nerve, especially atrophy of axon.

Key words: MCV. Nerve tissue. Disuse muscle atrophy.

Regular physical activity and age influence over natural killer cells activity and overall number

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Introduction: The purpose of this research is to acknowledge a better understanding between the differences in old and young, both sedentary and active when relating their particular activity to number and quality of Natural Killer cells in blood samples.

Methods: 12 amateur sportsmen have been selected. 6 of them were young between 21 and 28 years old, and the other 6 were old between 62 and 71 years old. 12 sedentary volunteers were selected of whom 6 were young between 24 and 30 years old and 6 were old between 62 and 77 years old. A basal blood test was performed at rest conditions. Natural Killer (CD3-CD56+) cells were analyzed in blood test by direct immune fluorescence using anti human D56 y anti human CD3 (Becton Dickinson, USA).

Results: Old sportsmen showed higher Natural Killer cell number (\bar{x} 16,71 ± 14.91) than young sportsmen (\bar{x} 7,36 ± 3.81). Young sedentary volunteers showed higher Natural Killer cell (\bar{x} 14,63 ± 13,27) than old sedentary ones (\bar{x} 8,35 ± 2,64).

Conclusions: Natural Killer cells show up in greater number in old sportsmen than in young ones. In the opposite it shows up in greater number in young sedentary individuals than in old ones. When comparing old sportsmen to old sedentary population it can be seen a elevation in Natural Killer cell proportion which carries a higher number of Natural Killer cell with little expression in CD56. This could indicate an elevated cytotoxic capacity in old sportsmen. It can be concluded that moderate exercise in old population has a direct benefit over Natural Killer cell. Number and function increases whereas intensive exercise deflects number and function in old and young sportsmen.

Keys words: Cytotoxic. Exercise. Adults.

Benefits of physical activity in the prevention and maintenance of the quality of life in patients of Parkinson's disease

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The motor development of an individual is a process that involves changes to the environment, carried through hereditary succession and motor tasks. The purpose of the present study is to evaluate the benefits of physical activities with the extended continued treatment in HOME CARE associated with the commitment that each family has with his patient joined to the multidisciplinary group influencing in the improvement or worsening of the symptoms and palliative care in subjects with Parkinson's disease, non practitioners and practitioners. In preventing acceleration of the condition and maintenance and / or improves the patient's quality of life in evaluated capacities motor physical appearance, and social. The sample comprises 15 subjects, from both sexes, between the ages of 50 – 80 years old.

The measure instrument was used for the evaluation of Parkinson's disease of protocol home care group's AMIL Healthcare Limited from Rio de Janeiro, Brazil. For analysis of the data it was used descriptive statistics and Pearson Correlation, having been used statistical software SPSS 16,0 ($p \leq 0,05$). Main conclusions: (I) The results had presented significant differences. However one better level of the motor profile was concluded that the Parkinson's carriers practitioners of the evaluated capacities compared with the Parkinson's carriers non practitioners of the no had evaluated capacities of accelerated the complications of the disease and delays in motor skills

Key words: Parkinson's. Motor development. Activity physical. Quality of life.

Physical activity in the prevention of diabetes and obesity

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Introduction: Cardiovascular diseases (CVD) represent the leading cause of morbidity and mortality all over the world. The main goal of researches in the last years has been the comprehension of the underlying risk factors, in the view of both primary and secondary prevention strategies. Overwhelming evidences point the reduction of cardiovascular morbidity and mortality as function of physical activity. Indeed, regular exercise has shown the capability of reducing chronic inflammation which plays a key role in the atherogenic process. Moreover, exercise training reported improved endothelium-dependent vasodilatation as a consequence of increased endothelial nitric oxide (NO) synthase (eNOS) activity which has been identified as a major mechanism explaining the numerous benefits of exercise in both healthy people and in those with different pathologic conditions. With regard to primary prevention strategies, it has been demonstrated that in young and asymptomatic subjects, the benefits derived from regular physical activity include improved cardiovascular fitness, increased lean mass, improved blood lipid profile, enhanced psychosocial well-being and decreased body adiposity. Moreover the benefits for youths with diabetes may also include better blood glucose control and enhanced insulin sensitivity. In order to obtain efficient results in term of primary prevention, it is essential to early identify the subjects with known risk factors when no symptoms are present with the aim of planning well addressed programmes of physical activity. With this regard, it has been recently demonstrated that sons of diabetic subjects show atherogenic endothelial disfunctions even with glicemic values within the reference range.

The aim of the present study was to evaluate the effects of a long lasting programme of physical activity on the cardiovascular risk profile of normoglycemic and asymptomatic sons of diabetic subjects.

Methods: 14 male subjects (age $23,77 \pm 6,27$) and 4 female subjects (age $24,25 \pm 7,9$) were recruited. Starting clinical evaluation consisted in the measure of blood pressures and heart rate. A complete cardio-pulmonary, abdominal and neurological evaluation as well as a head and neck examination was performed. The medical evaluation included a familial and personal medical history as well as a detailed physiological and sport personal history. Clinical assessment was completed by an electrocardiogram, an aerobic tolerance test and the analysis of fasting glicemic values, insulin, glycosilated haemoglobin, lipid profile and C reactive protein.

Subjects were divided in two groups. The first one is following a programme of individualized physical activity 3 days per week, 1 hour per session with 30 minutes of aerobic training (cyclette o al treadmill) and 30 minutes of muscle

optimization (Lat machine, Chest press, Shoulder press, Curl simultaneous, Push Down/French Press, Leg Press). The control group is not performing any physical activity during the follow up period.

Results and conclusions: At the end of the 6 months period each subject will repeat the baseline clinical assessment and known risk factors will be evaluated in light of the adherence to the programme of physical activity.

Key words: Diabetes. Prevention. Physical activity.

NUTRITION AND SPORTS SUPPLEMENTATION-I

Peptide glutamine supplementation for intermittent exercise tolerance among soccer players

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Introduction: After genetic characteristics and physical training any other aspect presents more importance than nutrition on performance. Because of that, there is a great number of studies searching for ways to enhance exercise tolerance. Nowadays the researches study glutamine effects in athlete's immunologic aspect, but few studies have been using glutamine for performance improvement.

Methods: Nine male soccer players (mean age: $18,4 \pm 1,1$ years; body mass: $69,2 \pm 4,6$ kg; height: $175,5 \pm 7,3$ cm; and maximum oxygen consumption of $57,7 \pm 4,8$ ml.kg⁻¹.min⁻¹) were evaluated. All of them underwent a cardiopulmonary exercise test and followed a protocol that simulated the movements of the game, in order to evaluate their tolerance to intermittent exercise. By means of a draw, either carbohydrate with peptide glutamine (carboglut: 50g of maltodextrin + 3.5g of peptide glutamine in 250 ml of water) or carbohydrate alone (carbo: 50g of maltodextrin in 250 ml of water) was administered to investigate the enhancement of the soccer players' performance. The solution was given thirty minutes before beginning the test, which was performed twice, with a one-week interval.

Results: A great improvement in the time and distance covered was observed when the athletes consumed the carboglut mixture. Total distance covered using carbo: 12750 ± 4037 m and using carboglut: 15571 ± 4184 m ($p < 0,01$); total duration of tolerance using carbo: 73 ± 23 min and using carboglut: 88 ± 24 min ($p < 0,01$).

Conclusion: The carboglut mixture was more efficient in increasing the distance covered and the length of time for which intermittent exercise was tolerated, with less feeling of fatigue in the players, when compared with the use of the carbo mixture alone.

Key words: Fatigue. Tolerance. Glutamine Supplementation. Carbohydrate Supplementation. Soccer players.

Consumption of ergogenic aids in long-distance amateur runners

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In the present study we try to know the condition of the consumption, type and who prescribes the ergogenics aids that there use the fond long-distance runners who compete in popular races of marathon.

Material and methods: The used sample is formed by 100 racers of both sexes, which at least have taken part during the year 2007 and 2008 in the popular marathon of Madrid. Of 100 racers 10 were women and 90 men, with an average of 35,6 years (standard deviation: 10,51), and a minimal age of 16 and maxim of 61 years. The information was obtained in the survey of nutrition validated by the School of Medicine of the Sport of Madrid.

The results were the following ones: 43% was taking ergogenics aids and 57% not. With regard to the type of ergogenics aids used: 82'5% took vitamins, 82'5 mineral %, 18'6% ginseng, 18'6% proteins and branched out amino acids, 9'3%

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carbohydrates, 11'6% mucopolysaccharides, 2'3% fiber, 4'6% fats, 2'3% royal jelly, 2'3% pollen and 2'3% Q10.

Of 43 mentioned racers 33 were taking an alone type of ergogenics aids (25 were taking only polyvitaminics and multimineral, 2 branched out amino acids, alone 1 vitamin C, 1 alone iron, 1 fiber and 3 cartilage); and 10 were taking two or more types of ergogenics aids (5 were taking vitamins C, I shoe and magnesium, 4 polyvitaminics and multimineral together with another help, 1 drunk and energetic bars).

With regard to whom it prescribes them, the results indicate the following thing: 62'8% to autotakes medicine, 16'3% the trainers, 16'3%, 2'3% directly the drugstore or shops of sports nutrition, 2'3% the companions of training.

Conclusions: There exists a high percentage of racers that take ergogenics aids, in the main in the shape of polyvitaminics and multimineral, taken together in the shape of an alone polyvitaminics; being the automedication the most frequent form of prescription of the same ones.

Palabras clave: Ergogenics aids. Fond long-distance runners. Marathon.

Protective action of sulforaphane on exhaustive exercise induced muscle damage in rats

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Introduction: Acute and exhaustive exercises lead to a burst of reactive oxygen species (ROS) generation that increases the GSSG/GSH ratio in plasma¹, and causes structural damage to muscle cells as evidenced by an increase in plasma activity of cytosolic enzymes such as lactate dehydrogenase (LDH) and creatine kinase. Acute exhaustive exercise can be considered an interesting model of oxidative stress and muscle damage. To prevent muscle damage during exercise, many studies have checked the possibility to use natural compounds acting as direct antioxidants, but the overall results are still inconclusive. In this study we have investigated the potential protective effects of sulforaphane treatment (SF) on exhaustive exercise induced oxidative stress and muscle damage in rats. SF is present in the human diet and originating from the ingestion of Cruciferous vegetables. SF is known to induce phase 2 enzymes with antioxidant properties in many tissues, but no data are still available on skeletal muscle tissues.

Methods: In our study male Wistar rats (age 4 months, weight 230±20g) were treated every 24 hours with SF (25 mg/kg bw i.p.) for 3 days before undergoing an acute exhaustive exercise protocol. The exercise protocol consisted in running on a treadmill at 24 m/min and 7% gradient. Exhaustion was defined as the point at which the animals failed to get off the shock grid and thus had to be manually repositioned to the front of the treadmill on 3 consecutive occasions. Animals were sacrificed and LDH activity was determined on plasma samples. The activities of phase 2 enzymes such as NAD(P)H:quinone oxidoreductase (NQO1), glutathione-S-transferase (GST), glutathione reductase (GR), glutathione peroxidase (GPx), thioredoxin reductase (TR) and superoxide dismutase (SOD) and catalase (CAT) as well as Trolox equivalent antioxidant capacity (TEAC) were evaluated in homogenates from freshly excised vastus lateralis skeletal muscle.

Results: SF treatment significantly induced the activity of NQO1, GST and GR in skeletal muscle tissues, with no effect on GPx, TR, SOD and CAT activities. Upregulation of phase 2 enzymes correlated with a decrease in oxidative damage in muscles, as evidenced by a significant increase in TEAC in muscle tissue homogenate and a decrease in LDH release in plasma after SF treatment.

Conclusions: Our data, in this first approach, demonstrate that SF could play a critical role in the modulation of muscle redox environment leading to the prevention of exhaustive exercise induced muscle damage. These results suggest that SF could be an interesting natural element in the development of a dietary intervention that promotes oxidant scavenging through phase 2 protein induction and in the development of new diet supplements for physical active people.

Research supported by Fondazione del Monte di Bo e RA

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Key words: Sulforaphane. Muscle damage. Exhaustive exercise.

Whey protein hydrolyzates can favor recovery from endurance training without improving performance

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Whey protein, a complex mixture of proteins derived from milk, is considered to be a functional food because of the number of health benefits it provides. Studies have suggested that the hydrolyzed proteins of whey could possess additional advantages, including the ability to improve physical performance. This study sought to compare the biochemical effects produced by feeding standard (AIN-93M) diets formulated with whey protein (WP) in two different forms: either the intact-isolate (WPI) or the hydrolyzate (WPH), and a control group that received casein as the sole source of protein. Male Wistar rats were segregated into six groups (n=10/group): three sedentary (S) and three trained (T). Rats in the exercised-trained groups ran 5 days/week on a treadmill, in a nine-week progressive-time and speed protocol. Weight gain for the S or T groups of rats was similar during the experiment, not differing statistically. No significant differences in the times of exhaustion (~56m7s, overall average) were observed among the groups due to the form of the protein in the diet. The metabolic markers AST, ALT, LDH, CK and creatinine, determined 48 hours after the performance test, showed that all of the parameters decreased with training, except for the casein group, in which creatinine increased from 0.500 ± 0.12 (S) to 0.546 ± 0.14 (T) mg/dL (p<0.005), but no statistical differences were observed among diets. In addition, the gastrocnemius glycogen level was significantly higher in T-WPH (13.91 ± 6.97 mmol/100g wet tissue, p<0.0001), suggesting that consumption of the WPH, unlike the other protein sources, could improve the capacity to recovery of the rat. In conclusion, it seems likely that WPH can be used as an auxiliary supplement to guarantee faster recovery, especially after routine tasks with heavy loads of endurance training, avoiding a possible overreaching or overtraining.

Key words: Whey protein. Rats. Physical performance. Protein hydrolyzates.

Comparative study of the iron supplementation in long-distance runners

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Introduction: The aim of this study was to detect and to describe the iron needs, in long-distance runners, according to the type of realized training, intensity and duration; and verifying if the iron administered in high doses (but inside the recommended limits), acts as ergogenic aid in these runners.

Material and method: An experimental, randomized, double blind study was designed, with 15 long-distance runners distributed in three groups, administering for three months the following compounds: Group I (n=5) ferrous gluconate (160 mg); Group II (n=5) antioxidants (vitamin C 500 mg and vitamin A 10000 IU/d) and Group III (n=5) glucose (placebo). Before the supplementation, all the runners gave their informed assent and made a treadmill maximal effort test, to determine their thresholds, VO₂max and maximum speeds developed, as well as to determine their performance parameters. Also there were realized complete blood and urine tests. All tests were repeated one month later and after three months.

Results and conclusions: The most significant results we found in the ferrous gluconate group, respect to the other groups, were: increase of the haemoglobin level (p <0.05); a rise in haemoglobin corpuscular average concentration (p <0.001); increase red blood cells count (p <0.002); a rise of the VO₂max (p<0.012); increase of the treadmill test duration (p <0.001), as well as decrease of the subjective sensation of weariness (p <0.002).

Though there are necessary later studies of major duration and with major samples, we can affirm that in our study the continuous supplementation with iron, prevents the anemia appearance and improves the aerobic performance, besides acting as an ergogenic aid in long-distance runners.

Key words: Iron. Supplementation. Runners.

NUTRITION AND SPORTS SUPPLEMENTATION-II

Impact of the strength training and β -hydroxy- β -methylbutyrate supplementation on muscular performance of endurance runners

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In endurance runners it has been proposed that training of strength could be able to bring a protective effect over muscle injuries without interfere with their aerobic performance and the use of nutritional supplements such as β -hydroxy- β -methylbutyrate (HMB) could have an additional positive effect preventing on a partial way, the proteolysis and muscle damage.

Objective: The purpose of this study was to evaluate the impact of the HMB supplementation in combination with a progressive weight training program over the development of strength and decrease of proteolysis in an endurance runners group of master category.

Methods: 14 runners (50.4 \pm 3.5 years old, both sexes), were assigned randomly in two groups which were supplemented with HMB or placebo. Both groups developed an individualized progressive training weight program during 12 weeks; at the end of this period of time, it was an interchanged of treatment to continue with the adjusted training program for 12 more weeks. During the study, muscular and fat areas of thigh were evaluated, one-repetition maximum for flexors and extensors of knees and test for peak torque by isokinetic dynamometry; it was also considered enzymatic activity of CK and LDH as biological muscle damage markers.

Results: There was a significant strong lineal correlation between muscle area and peak torque ($p < 0.05$) for flexors and extensors of knees and there was not evidence of the protector effect of HMB over muscle damage or its influence over the increment of muscle areas and the gain of strength ($p > 0.05$) at the dose used.

Conclusion: The development of a resistance training program impacts on the muscular performance of endurance runners without a perceptible effect due to the HMB supplement over the muscle fiber biochemistry.

Key words: Strength training. β -hydroxy- β -methylbutyrate. Muscular performance.

An almond based functional beverage enriched with a phenolic antioxidant enhances the erythrocyte antioxidant response induced by intense exercise

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Physical activity is associated with an overproduction of reactive oxygen species (ROS) that can overwhelm the cellular antioxidant defenses. ROS can also operate as messengers participating in the mechanism of induction of the antioxidant defenses. The diet supplementation with high doses of antioxidants could avoid the endogenous antioxidant response induced by physical activity. Our aim was to establish the effect of a diet supplementation with an almond based functional beverage enriched with a phenolic antioxidant on the erythrocyte antioxidant response to exercise.

Nine well trained female amateur swimmers were randomly and double blinded treated for 26 days with either a 1/2 L of functional beverage enriched with vitamin E (10mg/100mL) and vitamin C (30mg/100mL) or an experimental functional beverage with the same appearance, taste and composition but enriched with 0.4g/100mL of Planox L (extract of *Lippia citriodora*). After this period swimmers participated in a 30 min swim session at 80% maximal capacity. Blood samples were obtained in basal conditions before and 1 hour after the training session.

Catalase and superoxide dismutase (SOD) activities in erythrocytes maintained the basal values after swimming and were not influenced by the type of beverage consumed. The training session increased the erythrocyte activities of glutathione peroxidase and glutathione reductase. The type of functional food consumed influenced the final erythrocyte activities of both glutathione dependent enzymes. The functional food enriched with phenolic antioxidants induced the higher values of these enzyme activities. No effects of exercise or

type of beverage consumed were observed in plasma malondialdehyde levels as indicator of oxidative damage.

In conclusion, supplementation with low dosages of phenolic antioxidant nutrients enhances the antioxidant response of erythrocytes to a swimming training session.

Key words: Functional food. Antioxidant nutrients. Oxidative stress.

L-citrulline supplementation increases neutrophil nitric oxide production and oxidative burst after exercise

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L-arginine infusion, probably via nitric oxide (NO) increase, may alter skeletal-muscle metabolism during exercise. The non-essential amino acid L-citrulline may serve as an L-arginine precursor. NO regulates several important functions of polymorphonuclear neutrophils, including chemotaxis, adhesion, aggregation, apoptosis, and PMN-mediated bacterial killing or tissue damage. Our aim was to study if L-citrulline supplementation (6 g) prior to exercise could affect neutrophil NO production and the oxidative burst. We also evaluated the presence of exercise-derived oxidative damage.

Seventeen voluntary male pre-professional cyclists were randomly distributed in a double-blind fashion to one of two treatment groups (supplemented and control group) and participated in a flat cycling stage of 137.1 Km long. Blood samples were collected the morning previous to the cycling stage after overnight fasting, immediately after the stage and 3 h after the end of the stage.

Creatine kinase and lactate dehydrogenase, as markers of muscle damage and hemolysis respectively, remained unchanged in all situations. Neutrophil MDA, marker of lipid peroxidation, and DNA fragmentation, marker of apoptosis, were also unchanged. Nitrite levels significantly increased only in the L-citrulline supplemented group after exercise and maintained high after recovery ($p < 0.05$). Luminol chemiluminescence, marker of neutrophil oxidative burst, showed a progressive decrease of reactive oxygen species (ROS) production in the control group; this decrease was significantly different in the recovery period compared to basal values ($p < 0.05$). In the supplemented group, ROS production significantly increased after exercise ($p < 0.05$), but during the recovery period the neutrophil capability to produce ROS decreased when compared to basal values ($p < 0.05$).

In conclusion, a flat cycling stage was not enough to induce oxidative damage in trained cyclists. L-citrulline supplementation increased neutrophil NO production and retarded the reduction of the oxidative burst induced by the cycling stage.

Key words: L-citrulline. Oxidative stress. Nitric oxide.

Analyses of the macronutrients intake in children and adolescents students of Granada

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Introduction: The aim of the study was to study the ingestion of macronutrients in children (11-12 yr) and adolescents (15-16 yr) studying in the province of Granada, as well as the Body Mass Index (BMI).

Methods: The 72h recall questionnaire was used in a sample of children (16 boys and 21 girls) and adolescents (20 boys and 20 girls) from public and private schools of the province of Granada. The assessment of the average intake of energy, glucids, lipids, and proteins was developed by the use of the software Dietsource 1.2. The T test was developed to compare statistically the mean values of the estimated intake for the different nutrients, and the Recommended Daily Allowance (RDA).

Results: After the analyses it could be observed that the contribution of energy by means of proteins and lipids exceeded significantly the RDA, while carbohydrates showed a significantly lower value comparing to the RDA.

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According to the type of ingested lipids, the intake was greater to the recommended one for saturated fatty acids (significant differences), and for cholesterol (Trends of significant differences). The ingestion of monounsaturated and polyunsaturated fatty acids was lower than the recommended values (significant differences).

In children boys more than the 43% of the subjects showed a BMI value higher than the one considered as the normal by Cole et al (2000); In children girls, more than the 28% exceeded these values. In adolescent boys the 45% of the subjects showed values greater than those considered as normal, while the 20% of the adolescent girls exceeded these values.

Conclusion: The results suggest the necessity of the application of any kind of intervention program focused on nutritional aspects in children and adolescents from Granada to promote a healthy feeding pattern close i.e. to the Mediterranean diet with the aim of prevent obesity, diabetes, or cardiovascular diseases.

Key words: Macronutrients. BMI. Children.

Analyses of the micronutrients intake and physical activity level in children and adolescents of Granada

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Objective: The aim of the study was to analyse the micronutrients intake and Physical Activity (PA) practice level outside school in a sample of children (11-12 yr) and adolescents (15-16 yr) studying in Granada (Spain).

Methods: The 72h recall questionnaire was used in an accidental simple of children (16 boys and 21 girls; 11.46 ± 0.55 yr), and adolescents (20 boys and 20 girls; 15.8 ± 0.75 yr) from public and private schools of Granada. The daily micronutrients intake was assessed by the software Dietsource 1.2., and Student T test was used to compare mean values of the estimated micronutrients intakes with the Recommended Daily Allowances (RDA). PA level was determined by using specific questionnaire and individual interview.

Results: Significant differences were observed for the lack of E vitamin, Folic Acid, Potassium, and Calcium for all the studied groups comparing with RDA (p<0.03). In the children group for both genders and for the adolescent boys, a lack of D vitamin was observed although no significant differences were observed comparing with RDA.

All the groups except children girls showed significant deficiencies in Magnesium. Just for adolescent girls was found a significant lack of Iron.

Just 38.96% of the subjects showed to perform a moderate to vigorous PA ≥ than 2 hours per week during their outside school time.

Conclusion: It is recommended to increase PA levels in these early ages to also increase the energy intake and the quantity of micronutrients needed, especially in those groups that can be at risk (i.e. adolescent girls), but always taking into account the energy balance.

Key words: Micronutrients. Physical activity. Children.

NUTRITION AND SPORTS SUPPLEMENTATION-III

Cell injury, oxidative stress and cortisol levels related to nutrition in a ski-mountaineering competition

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Introduction: Intense exercise, particularly of eccentric mode, produces muscle damage, oxidative stress and hormonal changes¹. This has been described in many sports; however there is no information about ski-mountaineering competitions. On the other hand, the effect of the nutrition on these parameters is still controversial². The aim of this study was to measure cell damage, antioxidant

enzymes and blood cortisol during a two day ski-mountaineering race to ascertain the effect of the nutrition.

Materials and methods: 21 male skiers voluntarily took part in the study (mean age: 37.3 ± 7 y, weight: 73.5 ± 8 kg, height: 175 ± 9 cm, body fat: 12.8 ± 2 %). In this two day competition they covered 14.5km and a drop of 1350m on the first day, and 8.5km and a drop 850m on the second day. Skiers recorded in a diary all the food and fluid ingested the previous day and during the competition. The macro- and micro-nutrient content was then calculated (*Alimentacion y salud*, Bitasde, Mataix y cols. 0698.046).

Venous blood samples were taken the previous day and immediately after the race to measure in serum: Creatine Kinase (CK), Lactate Dehydrogenase (LDH), Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), γ-glutamyl transpeptidase (GGT), Alkaline Phosphatase (AP), Glutathione Peroxidase (GPX), Glutathione Reductase (GR), Total Antioxidant Status (TAS) and cortisol levels.

A student-t test was used to analyse pre- and post-competition differences. Also, Pearson's R was calculated to evaluate the correlation between the different parameters.

Results: CK, AST, LDH, CRP, GPX and cortisol levels significantly increased after the competition (p<0.01).

CK, LDH and cortisol were negatively correlated to total energy, protein and fat intake (p<0.05). Cortisol was also negatively correlated to carbohydrate intake (p<0.01).

The intake of vitamin A, B1, B2, B6 and niacin were negatively correlated to LDH and AP (p<0.05). CK was also negatively correlated to Na (p<0.05), Fe (p<0.05) and Zn (p<0.01).

Cortisol was negatively correlated to vitamins B1 and B2, and niacin (p<0.05).

On the other hand, GPX was positively correlated to the ingestion of energy (p<0.05), carbohydrates (p<0.01), proteins (p<0.05), vitamins A and B (p<0.05) group and folic acid (p<0.01).

Conclusions: A two day ski-mountaineering competition produces cell damage, and release of antioxidant enzymes and cortisol to the blood. Nutrition seems to be an important factor in these parameters. Particularly skiers should make sure that their protein, carbohydrate and fat intake is high enough, together with the total caloric intake. Also the ingestion of vit A, vit B group, Na, Zn and Fe are important in order to diminish cell damage and lessen cortisol levels.

Serum antioxidant enzymes' activities are also influenced by a high intake of energy and macronutrients, together with vitamins and folic acid.

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Key words: Ski-mountaineering. Muscle. Cortisol.

Analysis of the feeding habits in cyclists of the Spanish national mountain bike team

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Introduction: Athlete's correct feeding pattern can determine a better sport performance, being considered crucial the correct caloric and nutritional intake.

Objective: The aim of the study was to know the feeding habits of the members of the Spanish mountain bike national team to detect weaknesses and/or strengths.

Method: Fourty cyclists -Cadet, Junior, U-23, and elite categories- participated in the study. The sample was divided into two groups attending to the hours spent on training and competition level (25 Cadet and Junior- age: 16.68±0.99; weight: 62.94±7.01; height: 172.48±7.03; BMI: 21.10±1.29; body fat %: 11.92±1.98; Muscle mass %: 49.89±1.45; residual mass %: 23.46±1.31-, and 15 U-23 and elite- age: 25.33±4.25; weight: 60.24±6.97; height: 168.05±7.05; BMI: 21.28±1.48; body fat %: 11.49±1.42; muscle mass %: 54.31±1.42; residual mass %: 22.18±1.62-). A specific questionnaire and individual interview was used to get the data and a latest descriptive and contrast between groups (Wilcoxon) statistical analyses was developed.

Results: In the younger group 76% of the sample did 3 intakes per day, while for the higher group was 60% (p=0.348); four intakes per day were carried out

by 4% of the subjects of the younger group and 13.3% for U-23 and elite; five intakes were for the 20% of the younger group and for 26.7% of the U-23 and elite. The 64% of the younger eat between meals, while this value was significantly reduced to 26% for U23 and elite ($p=0.024$). Also, 56% of the younger used to eat "fast food" products, while for the higher group this was significantly reduced to a 20% of the U-23 and elite ($p=0.028$). Considering different aspects, in the younger group (cadet and Junior) 76% of the subjects show a considered "bad" feeding habit, while in the U-23 and elite group this value was significantly lower -36%- ($p=0.003$).

Conclusion: Results show the different and worse feeding habits showed by the younger (Cadet and Junior) in contrast to the U-23 and elite cyclists. It is not known if this is due to the age and the new tendencies or may be to the professional habits that could appear later in a more professional context. It is recommended to dedicate more time educating the younger from the earlier ages to get better feeding habits -i.e. including theoretical-practical formation in training camps for athletes and parents-.

Key words: Feeding habits. Cycling. Mountain bike. Performance.

Dehydration in gymnasts and fighters from the balearic school of sport of the Balearic Islands

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It is well known that hydration of the athlete is a factor that limits performance. Furthermore, a proper hydration is essential for the optimal development of the sport and, also, in order to maintain the health of the athlete. There are many methods to determine the degree of dehydration in athletes but, undoubtedly, the most widely used and simplest is to measure the variation in body weight. The aim of the study was to determine the dehydration in two different sports, gymnastics and fight. Twenty athletes participated voluntarily in the study, 13 gymnasts and 7 fighters. Eleven weight measurements (before and after the training sessions) were performed in each subject during the study. The water intake during training sessions was determined by weighting, before and after the session, the bottle assigned to each athlete. Water included in all foods consumed within the three hours previous to exercise was also determined. Temperature and humidity during the training sessions were recorded. The mean age, weight and height of the athletes participating in the study were respectively 16.6 ± 0.9 years, 48.8 ± 3.1 kg and 155 ± 2.6 cm. Temperature and humidity in the facilities during training were 27°C and 56%. During the training sessions gymnasts drank 213 ± 8 ml and fighters 417 ± 30 ml of water per hour of training, being statistically different. The total weight lost during exercise was 650 ± 35 g in gymnasts and 880 ± 47 g in fighters. In addition, the weight lost per hour of training was 167 ± 8 g in gymnasts and 385 ± 22 g in fighters. The percentage of weight lost was similar in both groups and was about 1.6 % in gymnasts and 1.4 % in fighters. In conclusion, although hydration in fighters is almost twice that of the gymnasts, hydration during exercise is insufficient in both groups of athletes. The weight loss observed in both sports is close to the threshold for the appearance of performance reduction symptoms. It is therefore necessary to make athletes and trainers aware of the importance of a proper hydration, especially in warm and humid environments.

Key words: Athletes. Hydration.

Eating dysfunctions in female athlete a meta-analysis

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Introduction: Eating dysfunctions constitute severe problems among athletes. They can affect both men and women, although the prevalence is higher in female athletes than in male. The onset of these dysfunctions may occur at a variety of different ages and can negatively influence athletic ability. Eating disorders are potentially life-threatening ailments, characterized by severely disturbed patterns of eating behaviour.

Objective: The purpose of this project is to examine eating disorders in female athletes, using meta-analysis.

Method: Twenty-one studies were used to examine the relationship between eating disorders in athletes and performance (elite vs. nonelite athletes), specific sports, age, cultural background and ethnic diversity.

Results: As shown in past studies, disorders are seen much more frequently in athletes than in non-athletes. Non-elite athletes were found to have a lower risk for developing eating dysfunctions. Certain sports seem to induce an increased risk of eating problems (e.g. swimming, aesthetic, and weight dependent sports). Athletic participation for fun, fitness and social interaction was found to have a protective role from developing eating dysfunctional patterns. Body dissatisfaction didn't seem to be a significant risk factor among female athletes with eating problems ($p < .01$), as opposed to female non-athletes.

Conclusions: Most frequently, eating disorders are developed during adolescence, but some reports indicate their onset can occur during childhood or in later adulthood. Eating disorders are not due to a failure of will. They are real medical problems characterized by maladaptive attitudes and patterns of eating. Both, athletes and non-athletes seem to have the same psychological profiles of eating disorders. Although socio-cultural explanations are relevant, anorexia nervosa and bulimia are perhaps better regarded as complex heterogeneous disorders with multifactorial aetiology, involving the interaction of genes, environment, family background, particular social factors and certain psychological features, such as: desire to win, approval of others, getting attention behaviour, perfectionism, self-criticism.

Key words: Athletes. Female. Eating disorder. Meta-analysis.

Relationship among gender, dietary habits, physical exercise practice and body composition in undergraduate university students

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Introduction: The aim of the study was to investigate if there are gender related relationships among dietary habits, physical exercise practice and body composition.

Methods: We recruited 48 male (24.52 ± 3.57 years of age) and 52 female (24.49 ± 3.63 years of age) undergraduate university students. Nobody had gone on a diet during the last 2 years. Both energy intake and dietary habits were assessed by a dietician from 3 day dietary records, by WinFood-due software (Medimatica). Physical exercise practice was investigated by a structured questionnaire requiring information about weekly frequency, duration, and consecutive years of training. Anthropometry included weight, height, waist circumference (WC), hip circumference (HC). Body composition was estimated by single frequency electric bioimpedance (Akern).

Results: We created 3 sub-samples for each gender according to their weekly frequency of training: low frequency (LF), middle frequency (MF) and high frequency (HF). Men did not show qualitative and quantitative dietary differences among the 3 groups, but we found higher values of body cellular mass ($p = .028$) and muscle mass ($p = .022$) in HF. In female students, LF had a lower fat free mass ($p = .036$), body cellular mass ($p = .010$), muscle mass ($p = .001$) and basal metabolic rate ($p = .028$) than HF. However, macronutrient distribution of HF was characterised by a non balanced diet because it had high lipidic ($p = .003$) and low carbohydrate ($p = .008$) assumption. HF had also major consecutive years of training than the others ($p = .003$).

Conclusions: Our results suggest that there is a gender related relationship between dietary habits and the amount of physical exercise practice. Only female HF had a high lipidic diet even if it had a normal body composition. On the contrary, all the other sub-samples had an optimal macronutrient distribution.

Key words: Gender. Nutrition. Exercise. Fat mass.

NUTRITION AND SPORTS SUPPLEMENTATION-IV

Incidence of diet and physical activity level in infant obesity

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Introduction: In recent years there has been considerable growth in the incidence of certain metabolic diseases among the child population. According to data from the Spanish Ministry of Health, 14-16% of Spanish children and young people aged between 2 and 24 years of age suffer obesity, while 26.3% are overweight. A decrease in physical activity and the new eating habits of children and young people, have been positively correlated with the prevalence of obesity. Therefore, the aim of this study was to evaluate the diet and the association between energy expenditure of school/out-of-school physical activity on overweight, obesity and insulin resistance in children at or around puberty at Tanner's Stage 3.

Methods: 137 children were classified into three groups: sedentary (2-3 h per week of physical education in school), active (4-5 h per week) and sports group (7 h per week). Dietary records (4 days) for total caloric intake and macronutrient intake were analyzed with 'Alimentación y Salud' software with standard food tables for Spanish populations. Homeostasis model assessment (HOMA) was used to evaluate insulin resistance. Anthropometry measurements and skinfold thickness were analyzed by standard procedures. Finally cardiorespiratory fitness was assessed using the Course-Navette test.

Results: Nutritional values showed no differences after four days of recording food intake, either in total energy consumption or in the percentage of contribution from macronutrients, but exceeded the recommended quantities of fats (37.3-40.4%) and proteins (17.4-19.5%). However, those children who practiced competitive sport outside school had anthropometric, cardiorespiratory fitness and metabolic indicators that were likely to prevent or reduce the risk of overweight, obesity and Metabolic Syndrome.

Conclusions: These data shown that in spite of the children take a wrong diet (hypercaloric and hyperproteic) the practising physical activity outside school can prevent the overweight and the risk of childhood obesity and Metabolic Syndrome.

This study was supported by grants from the Provincial Government of León and the MAPHRE Foundation.

Key words: Physical activity. Diet. Insulin resistance. Overweight. Obesity.

Energy and macronutrients intake of the swimming Spanish Olympic team in the CAR of Sierra Nevada

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Introduction: Nutritional assessment in elite athletes is essential to avoid nutritional deficiencies linked to athletic performance. This assessment is especially important during training at moderate altitude (2320m). The environmental changes can be exploited for the benefit of the sport performance. Nutritional assessment is especially important at moderate altitude. Sport performance has relationship with food quality of the swimmers.

Objective: The aim of this study was to evaluate the diet of the Swimming Spanish Olympic Team during a stay in the CAR of Sierra Nevada before the Olympic Games in Beijing.

Material and method: 9 swimmers (4 males and 5 females) were analysed (17-26 yrs) Dates were collected during may 2008 using a specific Diet Register created by the research team for sportspeople resident at the CAR of Sierra Nevada, in which the daily intake of all foods was recorded. The food composition tables of the national "Alimentación y Salud" programme were used for the nutritional evaluation of reported data. SPSS 15.0 software was used for the statistical study.

Results: For swimmers males the mean energy intake was 2985.2Kcal/d (SD: 623.2), 329.4g/d (SD: 85.1) carbohydrates, 162.3g/d (SD:41.6) protein and 120.5g/d (SD: 39.6) lipids. For swimmers females the mean energy intake was 3153.1Kcal/d (SD: 775.0), 391.6g/d (SD:109.8) carbohydrates, 172.2g/d (SD:68.7) protein and 108.3g/d (SD: 35.1) lipids.

Conclusion: The diet of the study population is generally moderate in terms of energy intake, according to data declared in the Register Dietetic-CAR Sierra Nevada possibly caused by the involuntary overestimation. It would important to studied each athlete (training, body composition, daily energy expenditure,

etc) to develop the nutritional requirements (energy, macro and micronutrients) for this population.

Acknowledgments: This work was supported by a postdoctoral grant from the University of Granada and a research project from CAR of Sierra Nevada. The authors wish to thank Rosa Ortega of the Spanish Sports Council Division of High Altitude Sport Performance Centres (CSD) for her support of sports nutrition research at the CAR of Sierra Nevada.

Key words: Diet. Swimmers. Nutrient intake.

Nutritional study of an Olympic Spanish athlete (20km walk men) during two weeks in CAR of Sierra Nevada (Spain)

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Introduction: Many elite runners have low total body weights, being small in stature and lightly muscle. Most runners will find that the typical western diet does not provide sufficient energy race training. Energy needs also increase because of the elevated energy expenditure with physical activity Carbohydrate intake after the session or race will ensure you meet carbohydrate needs before the next training session. Distance runners, particularly females, are at a high risk of low iron status. Many runners look like they eat adequate dietary iron but on closer examination, this can be mostly plant based iron food that are not well absorbed. It is important to know your sweat losses and drink fluid accordingly Fluid intake to ensure the replacement of water and electrolytes lost in sweat is important.

Objective: To evaluate the intake of antioxidant nutrients, as important components of the diet of sport people.

Material and method: A Dietary Antioxidant Quality Score (DAQS) was computed considering the risk of inadequate intakes for selenium, zinc, β -carotene, vitamins C and E. This score (ranged 0, very poor DAQS, to 5, high quality diet) Competitive athletes are thought to have a much greater likelihood of antioxidant vitamin sub-deficiency status as a result of an increased O₂ utilization. Athletes therefore represent a population potentially exposed to oxidative damage. In addition, alterations of the antioxidant status in athletes could also be related to specific deficiencies resulting from inadequate and unbalanced dietary intakes.

Results: This study analyze ten days diet of a runner (20Km walk) and estimated mean of energy 4147.0Kcal (SD:442.8): 20.5% from proteins, 56.3% from carbohydrates and 26.1% from lipids. Mean of DAQS is high quality diet 4.80 (SD: 0.42).

Conclusion: These runner have a balanced diet.

Acknowledgments: This work was supported by a postdoctoral grant from the University of Granada and a research project from CAR of Sierra Nevada. The authors wish to thank Rosa Ortega of the Spanish Sports Council Division of High Altitude Sport Performance Centres (CSD) for her support of sports nutrition research at the CAR of Sierra Nevada.

Key words: Diet. 20Km walk man. Nutrition.

Nutrient and energy intake of the 2008 world triathlon champion

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Introduction: The nutritional evaluation of elite sportspeople should be considered essential to achieve an optimal health status, avoiding deficiencies and covering all nutrient and energy requirements.

Objective: Evaluate the diet before a competition. The performance of the sportsperson is directly related to a good diet.

Material and method: We present the nutritional follow-up of the winner of the 2008 World Triathlon Championship (age=25 yrs, weight=70kg, height=179, BMI=19.55Kg/m²) held in June in Vancouver (Canada). This follow-up gathered data for the week before the competition, using a specific Diet Register created by the research team for sportspeople resident at the CAR of Sierra Nevada, in which the daily intake of all foods was recorded. The food composition tables

of the national "Alimentación y Salud" programme were used for the nutritional evaluation of reported data. SPSS 15.0 software was used for the statistical study.

Results: Mean energy intake was 5370.2Kcal/day(SD: 1062.4), protein intake 219.7g/day (SD: 32.3), carbohydrates 652.0g/day (SD: 85.1) and lipids 225.2g/day (SD: 72.1) (15.1%-47.4%-37.5%). Intake of MUFA was 87.4g/day (SD:25.5), of PUFA 43.3g/day (SD: 17.8) and of SFA 45.8g/day (SD:15.2). Mean intake of vitamins with antioxidant capacity was: vit. A, 1489.8.../day (SD:629.3), vit. C 258.8.../day (SD: 150.9) and Vit. E 22.5.../day (SD:6.8). Among minerals, mean intake of Fe was 27.6.../day (SD:6.0), Zn was 24.1.../day (SD:4.2) and Se was 234.9.../day(SD:48.6)). Comparison of the daily energy intake (Student's t test) showed significant differences among days (p=0.001).

Conclusion: The mean energy and nutrient intakes met Spanish recommendations for the general population. We highlight differences in energy intake due to training load, with a lower intake on the first day (journey) and on the last two days before the competition. This confers special importance to the correct planning of the diet of the sportsperson during sports meetings away from home to assist an optimal performance during the competition.

Acknowledgments: This work was supported by a postdoctoral grant from the University of Granada and a research project from CAR of Sierra Nevada. The authors wish to thank Rosa Ortega of the Spanish Sports Council Division of High Altitude Sport Performance Centres (CSD) for her support of sports nutrition research at the CAR of Sierra Nevada.

Key words: Diet. Triathlon. Nutrient intake.

Nutritional habits in high level Spanish and German swimmers

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Usually, the food is associated to the culture and customs of every country. About the consumption of fats, in most Western countries dominated the consumption of saturated fatty acids (SFA) whereas in the Mediterranean Countries, the origin of fat consumed are derived primarily from monounsaturated fatty acids (MUFA).

The aim of the present work was to study the nutritional pattern of fatty acids in the elite swimmer population coming from two different cultures: German and Mediterranean.

Subjects and methods: We studied seventeen Spanish and twenty one German population of both sexes, between 15 and 30 year-old (mean in Spanish of 24,65 y. and in German of 19,91 y.), and mean Body Mass Index (BMI) in Spanish of 22.8 and in Germans of 21.04. All of them were high level swimmers that were training at High Altitude Sport Training in Sierra Nevada (2320 m.). Participants were administered with a validated quantitative questionnaire (FFQ) with the food items classified by food group. Data were collected on the consumption or not of the item and the number of times it was consumed per week.

Results: The present work is based on the items 93-Butter, 94-Vegetable Margarine, 95-Bacon, 96- Mayonnaise, 97- Cream, 43-Which oil do you use usually for cooking?, and 44- What kind of oil do you use in the salad?. Analyses were performed with SPSS version 15.0. A significant intake in German population were the items 93-Butter (p=0,01) and 94-Vegetable margarine (p=0,008). No significant differences were observed in the item 43 (p= 0,104), although there were significant differences in the item 44 (p= 0,006), being the largest consumer of olive oil among Spanish population.

Conclusion: With these results we can intuit a higher consumption of SFA in German swimmers, as befits its central European culture. The difference between fat for cooking and fat to be used in salads appears to be due that athletes do not elect the fat with which they baked, but the use in the salad. Despite everything the consumption of olive oil in this population is limited, being replaced largely by butter and other fats. In this regard, we believe that should produce a change in habits of intake of SFA (butter and other fats) in this population to achieve a healthier diet with MUFA (olive oil).

Key words: Mediterranean diet. Fatty acids consumption. Nutritional habits.

NUTRITION AND SPORTS SUPPLEMENTATION-V

Sweat losses during game and practise in professional soccer players

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Introduction: Several studies indicate the need of proper fluids replacement in order to prevent dehydration during exercise or competition. Soccer players and coaches tend to underestimate proper fluid replacement or to use standardized, average sweat rates from scientific literature in order to establish a hydration protocol.

Aim: This study aimed to examine the possible differences in sweat rates between competition and training sessions during similar environmental conditions.

Materials and methods: Eleven acclimatized professional soccer players (age:23,4±4,5 y, body mass:74,4±7 kg, fat:8,1±2,2%) participated in this study. Sweat rates were estimated individually, using measured weight change (post-pre) and fluid consumption during game (Temperature:23-25 oC, Humidity:58±4%), moderate to high intensity training (Temperature:23-25 oC Humidity:58±4%), and moderate intensity training (Temperature:25-28 oC, Humidity: 62±3%).

Results: Sweat rates during game (3.2±0.8 lt) were significantly higher compared to sweat rates during moderate to high intensity training (1.3±0.7 lt) in the same environmental conditions (p< 0.01, t=12.2, df=7) and to sweat rates during moderate intensity training (1.2±0.4 lt) in higher temperature and humidity (p<0.01, t=9.7 df=8). On the other hand no statistically significant differences were found between sweat rates during different trainings in slightly different environmental conditions.

Conclusions: 1.Sweat losses during game should be estimated individually during occasions as they are significantly higher than those estimated during practice. 2. Slight differences in intensity of training and environmental conditions do not produce statistically significant variations in sweat rates.

Key words: Soccer. Sweat rate. Hydration.

Effects of pre-hydration on muscular power after intense soccer training

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Introduction: Soccer training consists of high intensity bursts of exercise interspersed with low to moderate levels of activity, leading to sweat losses that may result to dehydration. It is well documented that dehydration can significantly impair performance.

Aim: This study aimed to investigate the effects of pre-hydration on muscular power after intense soccer training on adolescent soccer players.

Materials and methods: 16 adolescent soccer players (age: 17.5±1.5y, body mass: 71.1±9.3 Kg, body fat: 7.1±3.1%), participated in this study. Subjects were tested for Squat jump (SJ), counter movement jump (CMJ) and 10sec continuous jumps (CJ) after two 70 minutes simulated training sessions. Trainings were performed one week apart and consisted of interval running and 4-a-side game (25-28oC, 60-65% humidity). Water consumption was individually the same in both sessions. Subjects were instructed not to consume any liquids 2 hours prior to the first experimental session. Pre-hydration (500ml-1 hour and 250ml of water 15min before training) was performed before the second session.

Results: Analysis of the results (paired samples t-test) showed that pre-hydration resulted to increased CMJ and CJ (4% and 9% respectively), however there was no statistically significant improvement in none of the three measured parameters (p_{SJ}=0.83, p_{cmj}=0,056, p_{CJ}=0,067).

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Conclusion: Our findings suggest that hydration prior to intense soccer training does not alter muscular power. However the observed increase in CMJ and SJ could affect the outcome of competitions when small differences separate winning from losing.

Key words: Soccer. Pre-hydration. Muscular power.

The supplementation with creatine increased of the time of exhaustion in intermittent exercise

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There is evidence that the fosfocreatina is a form of aerobic transport in the intermittent exercises at speeds near aerobics Maxima velocity (VAM). The objective of this work is to demonstrate if the supplementation with creatine increases the time of exhaustion in intermittent exercises at VAM.

Method: studied football players of 18 years old of the Boca Juniors Athletic Club, Argentina. We obtained the VAM in a direct test of maximum VO₂ in stages of a minute at with an increase of one Km/h until exhaustion. Soon they made a protocol of intermittent effort at stable speed 15 seconds of race by 15 seconds of passive rest until exhaustion to 110, 120 and 130% of the VAM. The time of exhaustion was of 25, 15 and 13 minutes respectively. Each group divided in creatine group (5 days of load to 20 grams per day divided in 4 takings) and placebo group (same dose of amino acid). An identical protocol to the previous one was made and the time of exhaustion was compared in percentage terms (Tabla 1).

Tabla 1. Argemi R, et al.

% VAM	Creatine Group	Placebo Group
110	33.7 %	9.7 %
120	15.3 %	11.0%
130	5.5 %	8.5 %

The difference between the creatine group the 110% and the other group was statistically significant (<0.01). Conclusions: the only group that increase the time of exhaustion was the creatine group at 110% of VAM. Demonstrating that the transport of PCr is useful in intermittent at aerobics speeds and not in lactasids intermittent.

Key words: Creatine. Supplementation. Intermittent effort.

Oral administration of vitamin C decreases muscle mitochondrial biogenesis, and hampers training-induced adaptations in endurance performance

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Background: Exercise practitioners often take vitamin C supplements because exhaustive exercise generates oxidative stress and may cause tissue damage. There is, however, considerable debate regarding the beneficial health effects of vitamin C supplementation.

Objective: This study was designed to study the effect of vitamins C in training efficiency in rats and in humans.

Design: The human study was double blind and randomized. Fourteen men (aged 27-36) were trained during 8 wk. Five of them were supplemented daily with an oral dose of 1g of vitamin C. In the animal study, 24 male Wistar rats were exercised with two different protocols during 3 and 6 wk. Twelve of them were treated with a daily dose of vitamin C (0.24 mg/cm² of body surface area).

Results: Administration of vitamin C significantly hampered endurance capacity. The adverse effects of vitamin C may be explained because it decreases the exercise-induced expression of key transcription factors involved in mitochondrial biogenesis. These factors are PGC-1, NRF-1 and mTFA. Vitamin C also prevented the exercise induced expression of cytochrome C (a marker of

mitochondrial content) and of the antioxidant enzymes superoxide dismutase and glutathione peroxidase.

Conclusion: Vitamin C supplementation decreases training efficiency because it prevents some cellular adaptations to exercise.

Key words: Free radicals. VO_{2max}. Antioxidant enzymes. Vitamins.

Modification of tradicional recipes to improve nutritional sport menu in CAR of Sierra Nevada

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Introduction: Nutrition is a factor for an optimum sportive performance. Diet is correct when it provides us energy, macronutrients and micronutrients. 10-15% proteins, 30-35% lipids and 50-55% carbohydrates. The sportsmen always need rich diets in carbohydrates and poor in fats to achieve this balance.

Objective: Thus the Unit of Sport Nutritional Investigation of the CAR Sierra Nevada study the modification of traditional recipes adapted to sportsmen request. Decrease the proportion of lipids and the improvement the quality of fat. Reducing the proportion of SFA, cholesterol and trans fatty acids. We have change recipes with animal fat like butter or cream by olive oil. Also the use of food that contain thickening agents (alginin, guar gum, gelatine, xanthan gum) has been deleted using starch.

Material and method: We present some traditionally refused dishes by sportsmen and that after this modification can consider them balanced for these results:

- Lentil soup (*Lens culinaris*) (*Traditional recipe*): 20% proteins, 41% lipids and 39% carbohydrates (SFA: 48.7g, MUFA: 75.3g, PUFA: 14.4g, cholesterol: 243mg).
- Lentil soup (*Sportsmen recipe*): 25% proteins, 18% lipids and 57% carbohydrates (SFA: 5.9g, MUFA: 23.9g, PUFA: 3.5g, cholesterol: 104.4mg).
- Pasta Carbonara (*Traditional recipe*): 10% proteins, 60% lipids and 31% carbohydrates (SFA: 134.1g, MUFA: 79.9g, PUFA: 10.6g, cholesterol: 684mg).
- Pasta Carbonara (*Sportsmen recipe*): 18% proteins, 22% lipids and 60% carbohydrates (SFA: 7.9g, MUFA: 24.3g, PUFA: 7.1g, cholesterol: 115.2mg).

Conclusion: In all the cases % of nutrients of the Sportsmen Recipes are adequacy for an optimal sport nutrition and a good health.

Acknowledgments: This work was supported by a postdoctoral grant from the University of Granada and a research project from CAR of Sierra Nevada. The authors wish to thank Rosa Ortega of the Spanish Sports Council Division of High Altitude Sport Performance Centres (CSD) for her support of sports nutrition research at the CAR of Sierra Nevada.

Key words: Traditional recipe. Sportsmen recipe. Diet.

SPORTS CARDIOLOGY-I

Soccer related sudden deaths in Turkey

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Introduction: As autopsy-based studies are infrequent in literature and there is lack of data detailing SD during physical activity in Turkey, we present a Turkish series of SD occurring during the soccer game. This series was examined via a detailed gross and microscopic post mortem examination by forensic examiners. The focus of this study was generally on causes of death during or shortly after practicing soccer and specifically on cardiac pathologies, pathophysiologic mechanisms, optimal screening strategies, and prevention.

Methods: The data of the Morgue Specialization Department of the Council of Forensic Medicine were reviewed in this retrospective study. Approximately 3284 unexpected and enforced suspicious deaths are evaluated annually by this department in Istanbul City. We identified 15 cases of soccer-related SD between

2000 and 2005. All cases were male aged from 10 to 48 years (25.7±13.5). Deaths that occurred during or shortly after soccer games and were autopsied between the period of January 2000 and December 2005 have been evaluated retrospectively, with respect to the subject's age, sex, incident site, course of incident, all postmortem examination findings and causes of death.

Results: In the light of the findings obtained from all postmortem examinations and the investigation data related to the SD, the cause of death was determined as CAD in 9 cases, CAD and HCM in 1 case, CAD and SAH in 1 case, HCM in 1 case. The cause of death in 3 cases was indeterminate.

Conclusions: As the number of individuals doing recreational sports for a healthy lifestyle increases, epidemiologic data on prevalence and causes of death gain importance. Thus, screening strategies can be reviewed and individuals doing sports infrequently and lacking fitness will avoid overexertion. Individuals should select a sport suitable for their age and general physical condition. Medical screening is important for all people interested in sport, not only for athletes, as a powerful means of prevention. We hope that reports such as this will increase the awareness of both the public and the medical profession of the dangers of exhausting exercise in unsuitable subjects and reduce the number of these tragic deaths.

Key words: Recreational. Soccer. Sudden death. Autopsy.

Playing position predicts autonomic profile in elite soccer players

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It is well recognized that the autonomic nervous system competence, as inferred by resting sympatho-vagal balance, is a key factor to investigate the exercise performance in the single subjects. In particular vagal predominance, with increased Rate Response (RR) variance and prevailing High Frequency (HF) spectral oscillations in normalized units (nu), results from medium intensity aerobic training, while sympathetic predominance, with reduced RR variance and prevailing Low Frequency (LF) oscillations, follows high intensity training. Elite soccer players show significant differences in work intensity according to playing position.

Purpose: We hypothesized that elite soccer players might display in consequence to the different load exercise associated to goal-keeper (G), defenders (D), midfield (M) or forwards (F) several different autonomic profiles than to the usual playing position.

Methods: We studied 22 First Division soccer players (ACF Fiorentina) (3 G, 6 D, 9 M, 4 F) throughout a full competition season (2006-2007). In all subjects rest hemodynamics, RR autoregressive spectral analysis and stress psychometrics were obtained after the summer vacation, and three other times about 2 month apart during competition season.

Results: A strong difference ($p<0.001$) was observed among playing position in autonomic markers: LF was greatest in F (54±4 than M 44±4) followed by D and G (30±3, and 29±3, all nu). A similar, but smaller difference was observed also for RR variance. This difference remained constant throughout the observation period. Conversely stress indicators were similar in different playing positions, but they changed during the season showing the highest values at the peak of the season.

Conclusions: Spectral analysis of RR variability in elite soccer players shows a significant difference in autonomic profile, with a stable prevalence of indicators of sympathetic predominance, that should not be ascribed to psychological factors, but most likely to the different playing loads.

Key words: Soccer player. Profile.

Left Ventricle performance by longitudinal peak systolic strain measurement in young athletes with Bicuspid Aortic Valve

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Background: Strain (S) is a measure of the regional and global heart function. S has a role in the identification of the myocardial dysfunction in presence of valvular disease. Bicuspid Aortic Valve (BAV) is a congenital cardiac disease, common in general population and in athletes where the EF maintains normal value with train-

ing in fact it is not an obstacle to obtain the eligibility when the degree of valvular insufficiency is mild. BAV is usually studied for the possible complications of the aortic tract however few data on the behaviour of the Left Ventricle (LV) in young are available. This study aims to evaluate if the measurement of S of LV adds any more information in BAV athletes with normal values of EF.

Methods: Three groups aged 25 ± 3 (20 trained athletes with BAV, 20 healthy athletes and 20 sedentary healthy subjects) were submitted to an echocardiographic exam evaluating the traditional echo-parameters. From four chamber view, using X-Strain software included in the MyLab 50 echo (Esa Ote-Italy) the Longitudinal Peak Systolic Strain (LPSS) at basal and medium-apical segments of Lateral Wall (LW) and Inter Ventricular Septum (IVS) of LV were calculated (Figure 1).

Results: The S values are within the normal and validated range in all the segments considered without any statistical differences among the three groups. However in BAV athletes, the S of basal segments of LV tends to be particularly lower creating a significant gradient from basal to apical regions (Table 1). EF is normal for all groups.

Conclusions: The evaluation of S in LV chamber of young trained BAV athletes

Table 1. Stefani Laura, et al.

	S %IVS	S %IVS	P	S %LW	S %LW	P
	basal	med-apic		basal	med-apic	
BAV	-17.7± 2.7	-21± 3.5	.001	-14.2± 2.2	-18.8± 4.2	.001
Athletes	-19.5 ± 5.9	-17.71± 3.8	NS	-19.05± 4.0	-18.80± 3.80	NS
Controls	-18.5± 4.8	-17.7± 3.96	NS	-20.28± 2.9	-19.82 ± 4.7	NS

Legend: BAV (Bicuspid Aortic Valve); IVS (Inter Ventricular Septum); LW (Lateral Wall)

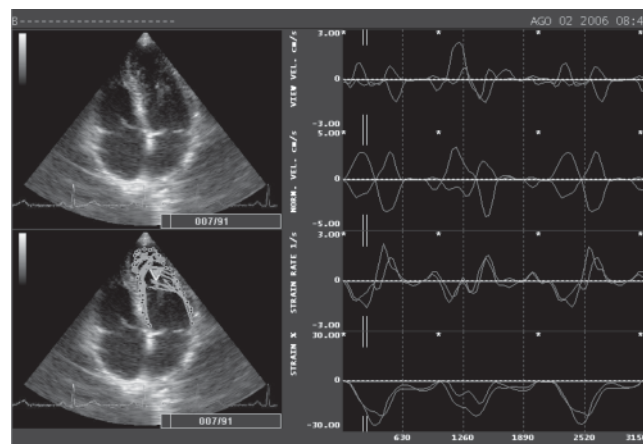


Figure 1. Stefani Laura, et al. This figure shows the assessment of strain in left ventricle by the application of X-Strain

confirms the normal LV performance. Despite of this there is a tendency in BAV to show the values of S in LV basal segments lower than in healthy subjects. The clinical implication of this will require further investigations.

Elite sailors: are their hearts all the same?

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Introduction: During the past decade some studies have been conducted to evaluate the energy demands of sailing. The results indicate that sailing in RS:X, Laser and Finn classes are associated with a high energy demand level. Nevertheless, as far as is known, no studies have analyzed the heart of elite sailors. The aim of the present study was to analyze echocardiographic parameters of our group of Spanish elite sailors from different Olympic classes.

Methods: 30 elite male sailors from the different Olympic Sailing classes were recruited. An echocardiogram was performed on each sailor as well as a maximal incremental exercise test on a cycloergometer in order to assess maximum oxygen uptake. Gas exchange and respiratory parameters were directly measured

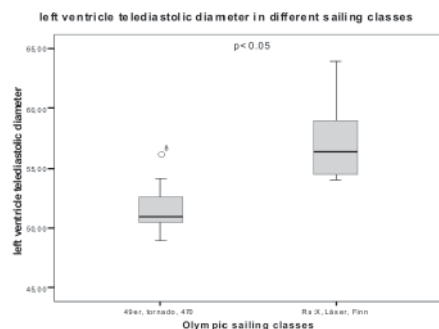


Figure 1. García-Borbolla Fernández R, *et al.*

breath by breath. The study subjects were separated into two different groups: Group 1 (14 sailors) including RS:X, Finn and Laser class (those with a higher metabolic requirements), and group 2 (16 sailors) from the other classes.

Results: Measurement of left ventricle telediastolic diameter in group 1 was 59.2 ± 2 mm, versus 52 ± 2.1 mm in group 2 ($p < 0.05$). Those sailors with a greater ventricle diameter also presented a higher maximum oxygen uptake on the cycloergometer test compared to other classes (59.42 ± 5.4 $\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ vs. 52.68 ± 4.01 $\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$), similar to that of other dynamic sports like rowing or canoeing.

Conclusions: In conclusion, this study shows that the heart of the elite sailors differs according to the class sailed. The sailors of RS:X, Laser and Finn class present greater ventricular diameters and higher oxygen consumption.

Key words: Echocardiogram. Heart. Sailing.

Detection of cardiovascular abnormalities in female football players using the Italian model of pre-participation screening

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Objectives: To describe the cardiovascular diseases found in female football players through the Italian model of pre-participation screening as a method for prevention of sudden death.

Introduction: In the last decade, increasing female participation in sport of elite level has exposed women to the development of possible cardiac abnormalities associated with the training and has raised the need to detect diseases that predispose to sudden death. In Colombia there are no data on the cardiovascular abnormalities found in female athletes during the pre-participation screening and the incidence of sudden death in them is unknown.

Materials and methods: Twenty-seven women belonging to the Colombia U-17 female Football team were valued using the medical history (following the Lausanne recommendations) a physical examination and an electrocardiogram (following the proposal for a common European protocol). Additionally, twelve of them underwent an echocardiographic study to determine the cardiac morphology and excluded cardiovascular disease.

Results: No woman showed abnormalities in the physical examination. Electrocardiographic changes were found in six players (22.2%), consisting of respiratory sinus arrhythmia, early repolarization pattern and incomplete right bundle branch block. Only one electrocardiogram was considered pathological (3.7%) because of a second-degree atrioventricular block Mobitz 1. The echocardiograms showed no alterations in morphology and Bi-Ventricular function, no coronary artery abnormalities were found, size and morphology of the aortic root, left ventricular cavity size, maximum left ventricular wall thickness and left ventricular mass were normal.

Conclusions: Despite the age and gender, there are electrocardiographic abnormalities in female footballers that make it necessary to perform a pre-participation screening. The clinical history associated with the electrocardiogram facilitates the detection of cardiovascular disease and its benefits can be applied in Colombia. It is necessary to increase the screening in Colombian athletes to establish electrocardiographic and echocardiographic patterns for the Colombian population.

Key words: Pre-participation screening. ECG findings. Female athletes.

SPORTS CARDIOLOGY-II

Electrocardiographic and echocardiographic findings in teenage athletes

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Objective: There exist nonpathological electrocardiographic or echocardiographic differences between adolescent athletes and nonathletes?

Methods: We studied 471 young students (mean age 15.5 ± 2.4 years; range: 12-19 years), 246 (52.2%) males, athletes and nonathletes, from the Health Public Center Huarte-Pamplona. They underwent a preparticipation examination (PPE) in agreement with the European Society of Cardiology recommendations, including a resting 12-lead electrocardiogram (ECG) to discard a left ventricular (LV) hypertrophy. Those persons with PPE criteria of positivity were referred for echocardiography. Echocardiographic LV hypertrophy was defined as LV mass > 96 gr/m^2 in women and 116 g/m^2 in men and the equivalent, age and height matched for young under 17 years (Malcom, *et al.*, 1993) and/or as > 13 mm interventricular septal thickness. The chi-square test was used to compare noncontinuous variables. The 2-tailed, independent-samples Student's t test was used for continuous variables. All values are expressed as mean \pm SD. Statistical significance was defined as $p < 0.05$.

Results: Echocardiography was proved necessary in 54 (11.5 %) youngs (23 were athletes), of whom 40 showed some positive ECG findings: one individual with a Wolff-Parkinson-White syndrome, one with prolonged QTc (both were excluded from the sport competition), a 36 young with LV voltage criteria, one with ectopic ventricular beats, and finally one more with inverted T waves in 3 consecutive precordial leads. As compared with nonathletes, the ECG of the athletes showed increased QRS voltages in the precordial leads $\text{RV}_{5,6}$, $\text{SV}_1 + \text{RV}_5$ (Sokolow-Lyon criterion) and $\text{SV}_1 + \text{RV}_6$ ($p < 0.006$ to $p < 0.001$). Women athletes showed a longer QTc interval (QTc 402.5 ± 17.1 ms vs. 394.5 ± 21.7 ms, $p = 0.003$), but statistical difference in the amplitude of QRS voltages was not showed. Within those 54 echocardiograms, 6 (3 men and 3 women; range: 15-17 years) showed a LV mass over the normal limits (111.2 ± 9.9 g/m^2 (range: 96.9-123.4 g/m^2). Only 3 had a LV hypertrophy voltage criteria. Of those 6 individuals, 5 were athletes (26.1%) and only one (3.2 %) nonathlete ($\text{Chi}^2 4.6$; $p = 0.03$). LV septal wall thickness meant 8.7 ± 1.3 mm (range: 6-12 mm). No structural and functional anomalia were discovered by echocardiography.

Conclusions: 1. The Sokolow-Lyon electrocardiographic criterion as well as a longer QTc interval, significantly more presents in teenage athletes, do not reflect a cardiovascular disease in these individuals, as is demonstrated by a posterior echocardiographic study. 2. However, a 12-lead ECG is a useful tool in basic preparticipation sport in young athletes. In our study two individuals were diagnosed, and excluded from sport competition, after this ECG study. 3. Our study may help to prevent ECG and echocardiographic changes in teenage athletes being erroneously attributed to disease. In our opinion, more specific electrocardiographic criteria should be applied to discard LV hypertrophy during a PPE.

Key words: Echocardiography. Electrocardiography. Athletes.

Repolarization abnormalities in competition sportsmen

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Objectives: To value the meaning of the alterations of the repolarization found in the routine ECG fulfilled in high-level athletes.

Methodology: We present a series of 15 sportsmen reported to this center specialized in Sports Medicine because it was found in the ECG alterations of the repolarization consisting on negative T waves more than 2 mm deep in at least three derivations. In all the patients anamnesis, complete physical exploration, echocardiography, treadmill testing and Holter ECG were done. Cardio-RMN was made in four of them.

Results: Only one of them was a sportswoman. The athletes, between the ages of 15 and 45 years, had no history of symptoms, nor family precedents of myocardialopathy or sudden death. The follow-up was held within 1 and 8 years. Ten of them were professional sportsmen, the remaining 5 were amateur sportsmen, but with a high level of training. The sports were cycling, football, athletics, tennis and swimming. In one of the sportsmen was detected an apical hypertrophy, reverting completely with

the cessation of the exercise, and normalizing likewise the ECG alterations. In the remainder the image tests were normal. In one of the cases the interpretation of the proofs gave rise to much controversy among different specialists, and three Cardio-RM were performed to rule out the existence of arrhythmogenic cardiomyopathy. In 78 per cent of the treadmill tests the alterations of the repolarization were eliminated during the maximum effort. Arrhythmic events were not registered in the 24 hours ECG. No clinic events were detected in the follow-up.

Conclusion: The meaning of the alterations in the repolarization patterns in healthy sportsmen is an object of discussion. Our series is an example of how these can be an innocent expression of the adaptation of the heart to the exercise. Nevertheless, the differential diagnosis with cardiopathies associated to sudden death can be difficult, therefore an exhaustive study and narrow follow-up is essential in all the cases.

Key words: Sports cardiology. Electrocardiography. Preparticipation screening. Repolarization abnormalities.

The ventricular function response to a sporadic exercise in sedentary subjects

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Background: The exercise effects on cardiac function in athlete were been the aim of so many studies before, revealed significant changes in the left ventricular (LV) systolic and diastolic function. However, it remains unknown this response in non athletic subjects.

Objectives: To determinate the effects of moderate sporadic exercise in sedentary adults we studied 16 subjects before and immediately following a seven-soccer by an echocardiographic study to assess LV geometry, systolic and diastolic function.

Methodology: Sixteen sedentary males (age range 25 – 56 years) were exercised on a play football match. Heart rate, arterial pressure, body mass, abdominal perimeter and biochemical parameters were recorded. ECG was performed. All subjects were performed a complete echocardiography study before and immediately after the soccer match, which include left ventricular end diastolic and systolic diameters (LVEDD, LVESD), end diastolic volume (LVEDV), ejection fraction (EF) by biplane Simpson's method and Tissue Doppler image for the lateral mitral annulus to obtain the diastolic filling trough the ratio E / e' .

Results: Ventricular diameters (LVEDD 50.18 +/- 4 cm vs. 49.3 +/- 3.9 cm, $p > 0.05$, LVESD 31.6 +/- 4.5 cm vs. 30.9 +/- 2.2 cm, $p > 0.05$) and EF (63 +/- 8 % vs. 64 +/- 7 %, $p > 0.05$) did not change pre and post match. E / e' ratio were unchanged as well (4.6 +/- 1.5 vs. 4.2 +/- 1.3, $p > 0.05$). There was a significantly decrease in LVEDV (115 +/- 28 ml vs. 101.4 +/- 24 ml, $p = 0.014$), nevertheless without alterations in the other parameters. No significant differences were found in regional or global systolic parameters.

Conclusions: Moderate sporadic exercise in non-active subjects is not associated with left ventricular systolic or diastolic changes.

Key words: Sports cardiology. Exercise. Echocardiography. Diastolic function. Systolic function.

Relationship between sports probation and RR' wave at young athletes

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Introduction: The right bundle of the branch block is result of interruption of the AV node after its bifurcation in one of the bundle branches, the right one. In normal way the ventricles are normally activated when a wave of depolarization propagated through the His-Purkinje system spreads through right and left ventricles.

Methods: The aim of research is explore appearance of RR' as an indirect sign of incomplete block of the right bundle in our two chosen groups: selected (77 young professional athletes, selected as the best one from all clubs in our country, from 12-14 years old) and recreative group as a control group (with the same age but without active training). We wanted to find out is this normal, physiological appearance at young children or is it a consequence of hard work training and hypertrophy of myocardium tissue at young professional athletes. We used non-parametrical statistic technique of χ^2 test and all data are obtained by Cardiax.

Results and conclusions: Our result is that RR' as a single factor was statistically very significant as predictor and his statistically significance on the level

0,001 obtained with statistical square test is $\chi^2 = 34,989$. So we might conclude that length of sports probation is an important predictor of frequency of RR' wave and that frequency is also the result of adaptive changes which are created by practicing of sports.

Key words: RR' wave. Sports probation. Young athletes.

SPORTS INJURIES PREVENTION-I

Performance stability - a new perspective on risk assessment and retraining for movement and sport

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Introduction: Pre-season screening of athletes is now common place in elite and professional sport and in competitive sport even at junior levels. This screening is promoted as part of either an injury risk management strategy or as a performance enhancement strategy.

Methods: The assessment is based on the specific assessment of the site and direction of uncontrolled movement, under low and high threshold loading at different joint systems within functionally orientated tasks. It utilizes multi-joint tasks that are generic (not task or sport specific) and are related to both low and high load movement functions. The testing does not focus excessively on testing individual muscles or joints. This testing process identifies a specific joint system as a 'weak link' demonstrating uncontrolled movement, within a chain of linked joints in functional multi-joint tasks.

Results: Weak links in terms of site, direction and threshold can help with the reasoning process of addressing some of these issues. Different individuals pass or fail different aspects of the testing process so that the individual's performance risks and assets can be determined. These risks and assets are used to develop a client specific Performance Profile. With an individual's performance assets and weak links identified, a specific retraining programme can be developed and implemented.

Conclusions: Identifying the weak link is of value to the sports therapist and other professionals working in the field as it is possible to identify uncontrolled movement before symptoms become apparent. The correction of these faults may prevent occurrence of pain and injury. This is a critical missing piece of the screening and risk management puzzle. However, further research is needed to explore unanswered questions, e.g. is it best to start with low load or high load retraining.

Key words: Risk assessment. Performance. Core stability.

The incidence of musculotendinous injuries in young soccer players

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Introduction: Soccer is a very popular sport practiced by thousands of people, but the incidence of musculotendinous injuries in youth players is unknown. These injuries are considered indicative of functional overload.

Methods: 204 soccer players aged between 13 and 19 yrs participating into 1,182 training sessions and 247 official matches were monitored for musculotendinous injuries during three consecutive seasons (2005-2008). An injury was defined as an incident occurring during training or match causing the athlete to miss the next training session or match.

Results: The incidences of the musculotendinous injuries, calculated per 1,000 hours of training and matches, are reported in the Table 1.

Table 1. Spedicato M, et al.

	Training		Matches		Total (training + matches)	
	N°	Incidence	N°	Incidence	N°	Incidence
Contracture	98	1.8	30	8.6	128	2.2
Strain 1°	12	0.2	3	0.9	15	0.3
Strain 2°	1	0.0	1	0.3	2	0.0
Strain 3°	1	0.0	0	0.0	1	0.0
Tendinitis	8	0.1	0	0.0	8	0.1
Totals	120	2.2	34	9.7	154	2.7

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The most frequently injured muscles were: hamstrings (n=44; 29% of the injuries; 0.8/1000 hrs); adductors (n=42; 27% of the injuries; 0.7/1000 hrs) and the rectus femoris (n=41; 27% of the injuries; 0.7/1000 hrs). Tendinosis injuries were mainly localized to the proximal insertion of the adductors (n=10; 7% of the injuries; 0.2/1000 hrs).

94 injuries (61%) were classified as light requiring less than 7 days of rest; 49 (32%) were classified as moderate, requiring between 7 and 30 days of rest, and 11 (7%) were classified as severe, requiring more than 30 days of rest. There were 29 relapses (19%), indicating an incomplete recovery after the precedent injury.

Conclusions: The incidence of musculotendinous injuries in youth soccer is 2.7/1000 hrs of practice and was higher during matches than training. Most of the injured players returned to practice within 7 days after the injury. The biarticular muscles are mostly affected by these injuries.

Prevention must be focused on warming-up, muscular strength, endurance and balance, and complete recovery after previous injuries. A correct diagnosis is a prerequisite for a successful therapy.

Key words: Epidemiology. Musculotendinous injuries. Youth soccer.

The determination of serum myosin as a marker of muscle injury in team sports

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Examination of fast and slow myosin isoforms and creatin kinase (CK) activity provides useful information on the state of the muscles and on the lesions that affect the fast and slow twitch fibres during sports activity.

The study follows two teams of professional athletes, one a soccer team and the other a basketball team, during the pre-season and the season proper. Subjects were evaluated in July, after the summer break, and then at various points during the season. Blood samples were extracted in July, August, October, December and March. Levels of fast and slow myosin and CK were evaluated as well as other biochemical parameters. Western blot analysis using specific antibodies was performed to evaluate myosin levels.

In the pre-season, myosin values in the serum from soccer players were normal, but fast myosin levels increased immediately after the beginning of training and competitive matches, indicating the existence of first degree lesions which were not observable by evaluating the CK alone. These lesions did not generally impede sports activities. During the season, the values fluctuate according to the activity, but tended to normalize. CK values were closely linked to slow myosin values, but not to fast myosin values.

The profile of basketball players was different. Myosin and CK values were higher throughout the pre-season and the season proper. The first training sessions and matches were also accompanied by an increase in lesions of both fast and slow twitch fibres. Myosin and CK values remained high throughout the season.

The examination of fast myosin provides information on the degree of injury of fast and slow twitch fibres and predicts their progression. These lesions are initially mild, but may evolve and become incompatible with sports activity.

Supported by two grants awarded by the Catalan government (1999 and 2003).

Key words: Serum myosin. Muscle injury. Sports.

Maxillo facial traumas in sport activities

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Introduction: In the last few years, the number of people who practise sporting activities in competition, education or recreation, has dramatically increased. The consequences of this is an increase of sport related traumas including cranium-maxillo-facial lesions.

Methods: A study has been conducted on cases over the past 40 years within our unit related to accidents during sporting practise with a comparison of age, type of lesions and sports.

It was possible to clearly verify the increase of maxillo/facial trauma through information collected from some of the most important maxillo-facial unit in Italy.

Results and conclusions: The facial skeleton structure, both for anatomic/structural and biomechanical reasons, is often exposed to trauma occurring from

sporting practise injuries. This is especially true in sport where contact is sought although, where contact is purely accidental, it appears fairly frequently.

In the past 40 years, approximately 25% of maxillo/facial traumas that have been treated in our unit have come from sporting activities with more than 60% of these being from soccer.

The nose suffering 42% of the injuries, orbitozygomatic complex 33% and mandible 25%. The third medium of the face appears to be susceptible to high deformability because it absorbs the majority of horizontal forces during an impact.

In some sports, protection systems have been adopted to protect athletes from such injuries. Although these systems continue to be modernized, the best tool of protection has proven to be a correctly fitted mouth guard.

Key words: Sport practice. Maxillo-facial trauma. Protection systems.

Lunge in youth fencing: analysis of the load on the lower limbs and differences in gender for the prevention of injuries

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Introduction: Fencing is a sport which imposes different loads for both the upper and lower extremities. Being aware of the load imposed by the lunge gesture both for the push limb and for the one used for ground contact on one foot is useful to structure training sessions which are geared towards performance improvement as well as risk reduction (Bisciotti, 2007). As a matter of fact, ground contact on one foot potentially constitutes one of the most dangerous gestures for non contact articular knee traumas (Bisciotti, 2007; Louw et al., 2006).

Aim: The work is determined to analyse the load imposed by the lunge gesture in youth fencing by highlighting the differences between the two limbs and, possibly, even differences in gender. Besides, the work is determined to observe if the specific load imposed by fencing gesture can also condition the phases of a symmetrical gesture such as the counter movement jump.

Materials and methods: The sample is represented by 44 athletes practising fencing: n males = 21, 15,8 ± 1,5yr, 175,3 ± 4,1cm, 70,1 ± 5,6kg.; n females = 13, 16,4 ± 1,9yr, 159,6 ± 4,8cm, 60,2 ± 11,1kg.

For the evaluation of the fencing lunge and jump using the Counter Movement Jump (CMJ) two dynamometric plates (Twin Plates, Globus Italia), and an accelerometer have been used, both supported by software to analyse the gesture. The statistic analysis has been carried out with the Wilcoxon test and its significance has been fixed at p < 0.05.

Results: Table 1.

Table 1. Sannicandro I, et al.

Lunge push limb	Men	Women
Concentric strength peak (N)	1106,7 (128)	884,5 (146,8)
Concentric strength peak speed (m/s)	2,7 (0,7)	2,3 (0,4)
Lunge support limb		
Strength impact on ground (N)	1025,7 (215,8)	724,8 (360,5)
Strength impact /BW	1,5 (0,3)	1,2 (0,6)

Discussion: The lunge can be described as gesture which requires substantial biomechanical differences for the two limbs. The push limb recruits the musculature with a concentric and explosive type of contraction highlighting average peak speeds of 2.7 m/sec for males and of 2.4 m/sec for females.

The limb which supports the impact, although mainly relying upon a regime of stretch shortening cycle muscular contraction, must bear loads of over 1000N for males and around 835N for females. However, when these values are normalised because of body weight they do not highlight any difference between the two genders.; 1,4 times the body weight for both males and females during ground impact.

The comparative analysis of the two genders highlights substantial differences in the execution of the lunge gesture in all of the other observed variables: there is therefore a need to envisage differentiated training for the two genders.

The correlation between the values of the push limb during the specific gesture and those obtained with a cmj (r=0,67 p<0.01) and those between two force peaks obtained by two different gestures (r=0,64 con p<0.05) in the female group points out how the technique substantially influences the behaviour of the two limbs even in a symmetrical kind of gesture.

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Bisciotti GN. *Il ginocchio*. Calzetti-Mariucci, Perugia. 2008.
 Louw, et al. *BMC Musculoskeletal Disorders*, 2006;7.

Key words: Prevention of injuries. Fencing. Lunge.

SPORTS INJURIES PREVENTION-II**The using of tensiomyographical evaluation for prevention of muscle injuries at athletes**

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Introduction: The most frequent causes of muscle injuries are the imbalance between the agonist and antagonist muscles, poor strength and/or a lack of flexibility of the muscles, the muscle is most vulnerable to injury in the rapid period of change from eccentric to concentric function. Tensiomyographical method was developed at Ljubljana University and it enables selective measurements of radial muscle belly enlargements in single muscle head. Muscle is stimulated with single electrical stimulus. Measured signal was correlated with muscle composition and represents the mechanical response of the skeletal muscle system.

Method: In our study we used twenty two athletes (soccer players), (age = 19±1.5 years; weight = 72±2.5 kg; height = 1.80±2.5 m). They were randomly divided into two groups: a study group and a control group. The both groups are used, during three months, some protocol for prevention of muscle injuries at lower limbs: strength training with eccentric overload, stretching exercises pre and post training session. Only at research group, the parameters of prevention training (frequency, intensity, muscle etc) were continuous changes, in relation with tensiomyographical evaluation. At control group, the parameters of prophylactic program were unchanged during of experiment.

Results and conclusions: After three months of prevention program at research group, the incidence of muscle injuries at muscles lower limbs was 7,5%, by comparison to the control group, where it was 19%. In conclusion, we suggest the using of tensiomyographical method for a better prevention programme of muscle injuries at athletes.

Key words: Tensiomyography. Muscle injuries. Athletes.

Epidemiology of pediatric injuries in Rugby Union

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Introduction: Rugby Union (RU) is a team sport characterized by the high number of physical collision and by a relative high risk of injury. The aim of this prospective cohort study is to document the incidence of injury in Italian pediatric RU.

Methods: 291 RU players aged between 6 and 15 yrs participating into 1,025 training sessions and 188 official matches, were monitored for injuries during the 2007-08 season. An injury was defined as an incident occurring during training or match causing the athlete to miss the next training session or match.

Results: The incidences of injuries, calculated per 1,000 hours of training and matches, are shown in the table, subdivided per age team (Table 1).

Table 1. Roi GS, et al.

Team	Training		Matches		Total (training + matches)	
	Injuries #	Incidence	Injuries #	Incidence	Injuries #	Incidence
Under 7	0	0.0	0	0.0	0	0.0
Under 8	1	0.3	0	0.0	1	0.3
Under 9	0	0.0	1	8.2	1	1.4
Under 10	0	0.0	0	0.0	0	0.0
Under 11	4	1.2	1	6.2	5	1.4
Under 12	2	0.4	3	9.2	5	0.9
Under 13	1	0.2	4	13.8	5	1.3
Under 15	3	0.2	1	1.5	4	0.3
Totals	11	0.3	10	5.1	21	0.5

We observed 10 fractures (48% of injuries), 3 knee dislocations (14%), 3 muscle strains (14%), 2 contusions (10%); 1 wrist dislocation (5%), 1 concussion and 1 ankle sprain. The injuries due to direct mechanism (contact) were 16 (76%) mainly occurring during tackles (n=15; 71%).

None of the injuries was classified as light (requiring less than 7 days of rest); 9 (43%) were classified as moderate, requiring between 7 and 30 days of rest, and 12 (57%) were classified as severe, requiring more than 30 days of rest and surgery in 4 cases (19%).

Conclusions: The total incidence of injuries in pediatric rugby is low (0.5/1000 hrs), but is significantly higher during matches (5.1/1000 hrs) than training. There is a tendency toward an increase of injuries with age.

Key words: Epidemiology. Pediatric injuries. Rugby Union.

Isokinetic analysis of flexion-extension shoulder strength in competitive young kayak and canoe paddlers

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Introduction: In kayak and canoe paddlers the shoulder is the joint with the highest physical demands and incidence of injury. The aim of this study is to compare the strength of the flexor and extensors muscle groups of the shoulder in kayak and canoe paddlers with a control group, by means of an analysis of the equilibrium between the antagonists.

Materials and methods: A total of 35 international competitive flatwater paddlers (15 male kayak, 10 male canoe and 10 female kayak) between 15 and 20 years of age, without shoulder pain, and 33 students (18 males, 15 females) consented to participate in our study. The evaluation of the flexion and extension muscles was conducted on a KIN-CON AP Chattanooga isokinetic dynamometer. Concentric peak torque measures of the dominant and non-dominant shoulder were performed at the speed of 60°/s in seated position. The range of motion has been established between 30°-150° (horizontal = 90°) in the scapular plane. Flexion/extension ratios were calculated.

Results: We observe significantly different values (p<0,05) between the dominant and non-dominant side in the male canoe paddlers. No differences were noted in the group of kayak paddlers (both male and female) and in the control group.

The comparison of peak torque between the groups shows significant differences between the female kayak paddlers and the control group on both sides in extension (p<0,001) and flexion (p<0,05).

In the flexion/extension ratio all groups show values below the normality value of 0,80, with values between 0,55 (female kayak paddlers) and 0,76 (male canoe paddlers).

Conclusions: The differences between dominant and non-dominant side in the canoe paddlers are because of the unilateral nature of this sport. The mayor involvement of the extensor muscles in the technical movement in both kayak and canoe paddling is likely to be the cause of the disequilibrium between the muscle groups and the tendency to injuries.

We observe the need to involve in a specific training program to improve the muscle balance to prevent shoulder injuries in kayak and canoe paddlers.

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Key words: Isokinetic. Shoulder. Kayak.

Lumbar work and posture in pole- vaulters

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Introduction: Pole-vault athletes need a specific physical preparation that includes strengthening of the paravertebral lumbar muscles to prevent the lumbalgias that this group of athletes often suffer, limiting their return to training or competition.

POSTER COMMUNICATIONS

Objectives: The aim of the study is to improve the lumbar strength with specific training of this area and analyze the changes that this training produces on the posture of three athletes.

Material and methods: We studied three pole-vaulters of high performance for 2 months. All were males aged 19, 20 and 29. Before beginning lumbar work, a stabilometric static test (Satel system) and a test for assessing the lumbar strength baseline (MEDX system) were performed. Lumbar work for 8 weeks consisted of a specific eccentric muscular workout with the MEDX system once a week, with a starting load of 50% the maximum muscular strength recorded in the first evaluation test.

Midway through the study, the athletes had an additional stabilometric static test. Upon completion of the 8 weeks a static stabilometric test and a lumbar test post-work were performed once again.

Results: The values of lumbar strength in the pole-vaulters studied at the beginning of the study were higher than the mean for the same sex and age of this population of athletes. After training, and increase of 25% of the lumbar strength was observed, with the athlete feeling of more stability and without relapse during the 6 months following the reinforcement work. Stabilometric data do not show significant changes reflecting a better overall stability due to improved lumbar strength. Although there are intra-subject changes, values between individuals cannot be compared given the variability of the data and the small sample of athletes.

Conclusions: Lumbar work with Medx in pole-vaulters is a good way to increase lumbar strength and prevent lumbalgias without changing postural parameters.

Key words: Eccentric muscular work. Stabilometry. Prevention. Lumbalgias.

Sports related injuries in no professional practice. A review serie

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Objective: To describe the demographics and types of sports related injuries in no professional practice.

Methods: The authors performed a retrospective chart review of no professional male and female athletes diagnosed as having an sport injury in a Sports Medicine Service for four years. Data collected were age, sex, sport, location and injury type.

Results: Three thousand two hundred and two injuries are review. The most frequent age were 16 – 20 years, 979 injuries (30,6%); 2595 patients were male (81%). The most common sports implicated were soccer (30,9%), basketball (22%), indoor soccer (15,5%), track and field (11,1%). Location: knee (24,1%), ankle (22,3%), hand (11,1%), foot (9,6%). Sprain (22%), muscle injuries (22%), contusions (14,5%), tendon injuries (14%) and fractures (10%) accounted for more de 75% of injury types.

Conclusions: Injuries in no professional athletes do occur especially in football and basketball, between 16 and 20 years. They are muscle sprains and injuries that affect the knee and ankle.

Key words: Sports injuries. No professional athletes.

SPORTS INJURIES PREVENTION-III

Fernández's Index in sports injuries prediction

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Introduction: The difference in the length of the lower members and the foot varus and valgus have shown that they are related to a greater incident in lower extremities injuries, as well as the articular laxity, the flexibility and biomechanics or structural parameters. Our purpose is to relate them among itself of mathematical form by means of equations of logistic decline.

Material and Method: Prediction of injuries by means of logistic decline. The models of decline include a series of technical math that try to measure the rela-

tion among a variable turned out and an or some variables. Shambaugh (1991) relates structural measures with the incident of injuries in the lower extremities in basketball players by means of an equation of logistic decline of three variables that predicted the probability of wound in a 91%.

Shambaugh' injuries index: Imbalance of weight • 0,36 + Angle-Q right deviation • 0,48 + Angle-Q left deviation • 0,86 – 7,04.

Salazar (2000) contributed a new mathematical injuries predictor formula by means of an analysis of logistic decline.

Salazar' injuries index: $1/1 + e^{0.1621 - 0.06344 \cdot \text{Shambaugh Index Medium}^*}$

Results: We have submitted to analysis the different predictor variables in athletes (14 and the 18 years) obtaining the following mathematical algorithm:

Fernández' injuries index: $1/1 + e^{-(0.757 \cdot \text{QA} - 0.647 \cdot \text{DLM})}$. QA: Femoral q Angle; DLM: Dismetry Lower Members.

The good classification of the model obtained was of the 68.6%. The Cut point (0.5), indicates that the subjects with equal values or over 0,5 would remain fit in in the category of possible injured while a lower value would fit in them inside the category of possible unharmed.

Conclusions: The analysis by logistic decline can be a valid method in the discrimination of anthropometrics parameters related to the injuries.

Key words: Fernández' Index. Injuries. Lower members' imbalance.

Injury prevention through balance and coordination analysis in elite basketball players

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Within basketball, injuries most commonly appear in lower limbs. In the Spanish National League, these are up to 46,13% of the whole; within the NBA, there ratio is higher, even 57,3% (Morales Menezes, 2003). Muscular instability in lower limbs, and coordination and balance impairments are injury risk factors. Using devices which can show such problems in these motor skills is essential in the medical evaluation of these sportsmen, in order to prevent such injuries.

Objectives:

1. Find out whether Neurocom Balance Master is a suitable device to assess and discriminate balance, coordination and postural skills in elite basketball players.
2. Find out which tests and parameters are better to assess impairments regarding balance and coordination.
3. Assess balance on stable and unstable surfaces, analysing re-balance ability and skills.

Materials and methods: Neurocom Balance Master System Posturographer.

Subjects: 30 healthy elite basketball players (age range 19 – 25 years)

Method: 1st: General and specific warm up. 2nd: Protocol. (Use of statistics pack SPSS. 15.00).

Table 1. De Campos Gutiérrez de Calderón, et al.

Tests	Parameters	Units
Weight Bearing/ Squat	Percent Body Weight	%
Clinical Test of Sensory Interaction on Balance (modified CTSIB)	Mean Center of Gravity (COG) Sway Velocity	°/s
Unilateral Stance	COG Sway Velocity	°/s
Limits of Stability (LOS)	Reaction Time	Seconds (s)
	Movement Velocity	°/s
	Endpoint excursion	%
	Maximum Excursion	%
	Directional Control	%
Rhythmic Weight Shift	On-Axis Velocity	°/s
	Directional Control	%
Step Up/Over	Lift Up Index Difference	%
	Movement Time Difference	s
	Impact Index Difference	%

Results:

1. In the LOS test, the Movement Velocity was higher in basketball players than in the control group.

- In the CTSIB test (over foam with closed eyes), the COG Sway Velocity of basketball players is lower than in the control group.

Data and results will be shown within graphs and tables.

Conclusions:

- Posturography using Neurocom Balance Master is a suitable method to assess balance and coordination features in elite basketball players.
- Specific posturography tests allow detection of injury risk factors, such as balance impairments.

In this trial, the results belong to data obtained along the development of the project: "ViiP: Intelligent System for Isokinetic and Posturographical Analysing, Integration and Assess of the Spine", financed by the Ministry of Science and Innovation. Research Head Office Science and Technology I + D.

Effects of rhythmic gymnastics in growing youths (GRD)

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The objective is to correct the negative opinion that surrounds G.R.D such as being the cause of problems in the alignment of the spine and to understand its effect on children who practice it. The G.R.D. puts emphasis on correct the spine, the development of the resistance and muscles forces and good flexibility of the lumbar and hamstring muscles.

The hypothesis that presented by the young medical instructors of G.R.D. is that they will display more reduced angular values with respect to children who don't participate in gymnastics although in raquis lumbar the values more will be elevated in young medical instructors of G.R.D.

Material and method:

Sample: 163 gymnasts, 79 children who do not practice extracurricular physical activity a random selection between 7 and 14 years of age.

Control by design of variables according to age, equal distribution between groups. The groups of gymnasts balanced according to the years and hours of training.

DYNAMIC valuation of the spine in the lateral plane during the flexing of the trunk (test DD-S and DD-P), we measured °CD and °CL with inclinometer, for the indices of normality shown by Santonja, 1994; Ferrer, 1998; Rodríguez García, 1998. Sitting position valuation in the lumbar buck by means of °L-H (thrust) with goniometer.

Descriptive analytical design of nature case-controls, Ancova with tests post-sickle.

Results: We did not observe structuring of Kyphotic and lordotic curves, due to the cases of hyperkyphosis and hyperlordosis to postural attitudes.

In Dorsal ° kyphosis the averages obtained for all the groups are within normal ranges. To emphasize that the dorsal zone of the gymnasts does not present any case of moderate Kyphosis, being the average of the gymnasts of competition in smaller values.

In lumbar ° Kyphotic the average of the groups presents lumbar kyphosis of a slight degree, observing better values in the control.

In °LH-sed pelvis presents slight retroversión as a percentage elevated for all the groups.

The comparison intergroup indicates significantly smaller differences in the gymnasts of competition with respects to other groups in Dorsal ° Kyphosis. Being appraised differences it does not stop lumbar ° Kyphosis and °L-Hsed.

Conclusions: In maximum flexing of the trunk, spinal dorsal of the gymnasts is normal, smoother in competition gymnasts. To these improvements they contribute, the fortification of the muscles of the trunk and exercises of compensation at the end of the training, to avoid muscular imbalances.

The slight lumbar Kyphotic positions that present the gymnasts must possibly due to elements of hyperextension and hyperflexion of the trunk, which cause risk of hypermobility in spinal lumbar and must be taken into consideration to prevent possible injuries, not considering the practice of educative rhythmical gymnastics.

In sedentation the lumbar zone presents slight Kyphotic attitude, without significant differences between groups. With an adapted work of postural hygiene, it would have to obtain smaller investments of the lumbar curve, this does not produce, we believe due to the lack of awareness of the trainers on this aspect.

Key words: Health gymnastics. Spinal-gymnastics. Postural education.

Incidence of injuries during the U23 European Fencing Championship

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Introduction: The use of protective devices by athletes has reduced the incidence of injuries during fencing competition and training. Nevertheless not only the physicians who act as medical supervisors of fencing competitions, but also the trainers have to know the incidence of fencing injuries and their severity in order to be able to prevent and manage them. The purpose of the present study was to estimate the incidence of injuries in a new fencing competition: the Under 23 European Championship.

Methods: Data were collected during the First edition of the Under 23 European Fencing Championship held in Monza, Italy, from the 9th to the 11th of May 2008. The mean (\pm SD) age of athletes was 20.7 \pm 1.7 years.

Injury was defined as a request for medical attention. Athlete Exposure (AE) represents the opportunity for one athlete to incur an injury and was calculated by doubling the number of contested bouts, as indicated on the official organizational spreadsheets, for each event. No differentiation was made between pool bouts and direct elimination bouts. Rate was calculated per 1,000 AE.

All the injuries were evaluated and treated by the sports medicine staff of the competition, who had to complete a report on each injury.

Results: Table 1 shows the incidencies of injuries in the different fencing specialities: foil male (FM) and female (FF); sabre male (SM) and female (SF); epee male (EM) and female (EF).

Table 1. Ricci M, et al.

	FM	FF	SM	SF	EM	EF	Total
Fencers (n°)	46	35	43	34	71	52	281
AE (n°)	330	262	288	250	498	374	2,002
Injuries (n°)	2	2	0	3	3	1	11
Rate (x 1000 AE)	6.1	7.6	0.0	12.0	6.0	2.7	5.5

The 11 injuries (requests for medical attention) were classified as: i) injuries due to opponent's weapon: 5 cases (45%) including 4 finger's wounds (36%) and 1 shoulder's abrasion (9%); ii) other injuries: 3 ankle sprain (27%; 2 relapses), 2 epistaxis (18%) and 1 lumbar contusion (9%).

No bouts were cancelled due to these injuries. No injuries were due to broken blades.

Conclusions: The data of the present study indicate that the new Under 23 fencing competitions have a very low risk of accident and injury. The most frequent sites of injuries were the fingers and the ankles. Right technique, adequate training and functional recovery after injury can help prevent these injuries.

SPORTS MEDICINE-I

Differences in the recovery period between a group of CFS women and matched control group after a supramaximal effort

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Objective: To evaluate if the cardioventilatory response observed in CFS (chronic fatigue syndrome) patients, during the performance of a supramaximal exercise test and three minutes of recovery, may correlate with the clinical symptoms referred by these patients (tiredness, muscle weakness).

Methods: A group of 211 CFS women (age: 47.5 \pm 8.1 years; height: 161.0 \pm 5.8 cm; weight: 66.9 \pm 13.0 kg) and control group of 24 healthy women (age 44.1 \pm 10.6 years; height: 159.0 \pm 5.8 cm; weight: 68.2 \pm 12.4 kg), of similar lifestyle, physical activity and social status, performed a graded exercise test up to exhaustion. The study was approved by the Ethics Committee of the University Hospital of Bellvitge and all participants signed an informed consent.

Protocol: After 4 minutes of warm up at 0 watts, the subjects performed a graded exercise test in a cycleergometer with the workload being increased at a rate of 20 W/min, up to exhaustion (maximal test). After 4 minutes of recovery, performed a ramp protocol exercise test increasing the maximal workload achieved during the previous test every 30 seconds to the point of exhaustion (supramaximal test). Respiratory response, heart rate and Borg's index were recorded along the test. The differences between the values recorded in the control group and the CFS group were analyzed by variance analysis for repeated measures. Student t-test for unpaired samples was used to compare the different parameters between both groups.

Results: We have found substantial differences in the supramaximal workload between both groups: 237.9 ± 54.3 w, in the control group, versus 148.3 ± 75.7 w, in the CSF group (63% of the power-output of the control group).

Ventilatory tidal volume, VO₂ uptake, CO₂ production and RQ showed a different evolution along the test in both groups, with significant higher values in the control group.

ERO₂, PETO₂, heart rate and O₂ pulse showed higher values in the CFS patients during the resting period, the supramaximal test and the first minute of the recovery period.

Conclusion: The control group, of healthy subjects, showed a much larger power output and, correspondingly, higher values in VO₂ uptake, CO₂ production and heart rate during the performance of the exercise test. The CFS group showing a smaller ventilatory efficiency, more marked during the exercise test and the first minute of the recovery period. Thus, it appears to exist a reduced ventilatory efficiency in the CFS group that may be responsible for a lower PCO₂ in blood associated to the sensation of weakness and distress that these patients experience after a physical effort of high intensity.

This study was funded partially by a grant (FIS PI051487-2006).

Key words: CFS. Exercise. Recovery. Cardioventilatory response.

Effect of exercise intensity on circulating thyroid hormones

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Introduction: Although it is well known that control over metabolism during exercise is related to the hypothalamus-pituitary axis, the effect of exercise on circulating thyroid hormones is still subject to controversy. We studied the effect of aerobic exercise of incremental intensity on the profile of thyroid hormones.

Materials and methods: A group of 12 healthy volunteers (average age = 21.2 years) performed a graded exercise protocol to exhaustion on a treadmill ergometer, beginning at a speed of 6 km/h and 2 km/h increments every 10 minutes with breath-by-breath measurements of oxygen uptake, carbon dioxide output, ventilation, and the ECG heart rate. Blood samples were taken 30 minutes before the start of the test, at the beginning of it, at the end of each step completed, at the end of the test and 15 minutes later. In each blood sample were determined values of TSH, free thyroxine (FT₄), free triiodothyronine (FT₃) and triiodothyronine reverse (rT₃).

Statistics: All data are expressed as means \pm SE. Differences between exercise intensity was identified by using t-Test. Bivariate correlations were carried out between hormonal parameters through Pearson's Correlation Coefficient. For statistical analyses, significance was accepted at $p < 0,05$.

Results: The levels of FT₄ and FT₃ decreased significantly at the end of test ($p < 0,05$).

TSH levels increased during the test ($p < 0,001$)

rT₃ levels increased during the test ($p < 0,05$).

There was significant correlation between the values of FT₄ and rT₃

Conclusions: There is an increase of TSH levels during the test suggesting an increase of the stimulus in the secretion of the thyroid gland.

There is a drop in FT₄ levels, which could be due to an increase in the peripheral conversion of T₄ to T₃.

There is an increase in rT₃ levels that could be due to an increase in the peripheral conversion of T₄ to rT₃ and T₃.

There is correlation between the values of FT₄ and rT₃ that could be the result of the increase of T₃ and T₄ levels total during the test by haemoconcentration.

There is a drop in FT₃ levels at the end of the test, despite increase in the conversion of T₄ to T₃, due to increased aerobic metabolism during exercise carried out.

Key words: Aerobic exercise. Exhaustion. Thyroid hormones.

Injury incidence in the European shooting sport championships

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Introduction: We have developed a descriptive study about medical assistance carried out during the European Shooting Sport Championships, held in July 2007 in Las Gabias (Granada). The aim of such study is to value the incidence of injuries and pathologies that have taken place during the championships, in order to optimize prevention and assistance in similar events. This is a novel kind of study, for those carried out on this subject only include the sportsmen and sportswomen as the target population and not all the competition participants.

Methods: the target population, a total of 1570 people, was divided in four categories depending on the role they performed: staff, volunteer, Spanish Shooting Sport Team and other teams. All the pathology related data, as well as the population category that those who had had medical assistance belonged to, were collected and subsequently analyzed. Results: the most frequently assisted pathologies were injuries due to high temperature and sun exposure, musculoskeletal pain, insect bites and anxiety episodes. The population category that needed a greater number of medical assistances was the staff (56,1% out of the total), resulting in a great difference with the rest of the categories.

Conclusions: we find it necessary to insist on the prevention of those pathologies produced by high temperatures and sun exposure, due to their potential seriousness, doing special emphasis in the population category staff.

Key words: Injury. Incidence. Shooting. Sport.

Role of α -actin in muscle damage of injured athletes in comparison with traditional markers

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Objective: In order to identify a reliable marker for the early detection of muscle injuries in sports, α -actin protein and other markers of muscle damage were studied in sera of uninjured sportspeople and those with skeletal muscle injury.

Methods: Blood samples were obtained from 20 sportspeople with skeletal muscle injury and 48 uninjured sportspeople. Immunoassays were performed to determine cardiac troponin I (TnI), troponin T, lactate dehydrogenase and myoglobin concentrations. Western blot and densitometry were used to measure α -actin concentrations. Skeletal muscle damage was diagnosed according to physical examination, MRI findings and the biochemical criterion of a creatine kinase value. 500 IU/l (Rosalki method, Beckman Instruments SL, Fullerton, California, USA). Results were also compared with previously obtained data on injured and uninjured non sportspeople.

Results: The mean serum concentration of α -actin was significantly higher in sportspeople with muscle damage (10.49 mg/ml) than in uninjured sportspeople (3.99 mg/ml). Sera from injured sportspeople showed higher levels of α -actin than of troponin or myoglobin. No significant difference in TnI levels was observed between the groups.

Conclusions: According to these results, α -actin is a new and reliable marker of skeletal muscle damage in sportspeople which can be used for the detection of muscle injury. Possible cross interference between skeletal and cardiac muscle damage can be discriminated by the combined use of α -actin and TnI. These data suggest that early measurement of α -actin in sportspeople with suspected muscle damage will allow them to receive earlier and more effective treatment and to return sooner to the practice of their sport.

Key words: α -actin. Muscle injury. Sportspeople. Immunoblotting.

SPORTS MEDICINE-II

The characteristics on body composition, cardiopulmonary function and lipid metabolism of sumo wrestlers in university

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Purpose: In order to examine how cardiopulmonary function (CPF) and lipid metabolism of sumo wrestler are affected by their obese states, we measured body composition (BC), CPF and lipid metabolism regarding sumo wrestlers in university (SW) and young patients with lifestyle related disease (Pt).

Subjects and method: Subjects were 19 SW (19.7±0.9 y. o.), 6 male Pt (23.7±4.6 y. o.). Fasting blood tests were conducted in early morning for in order to determine levels of serum lipids (total cholesterol (TC), HDL-cholesterol (HDL-C) and triglyceride (TG)), serum enzymes (AST, ALT and gamma-GTP), glucose (BG) and uric acid (UA). We carried out exercise tolerance tests including respiratory gas analysis (RGA) in order to measure peak oxygen uptake (peakVO₂) and maximal lipid oxidation rate (MLOR). We measured BC, such as body height (Ht), body weight (BW), waist circumference (WC) and % body fat (%BF). In addition we carried out CT scanning or MRI in order to measure areas of visceral fat (AVF) and subcutaneous fat (ASF) at the level of navel. Comparisons between SW and Pt were calculated by Student's unpaired t-test, the p-value <0.05 was considered statistically significant.

Results and conclusion: Results of BC measurements in SW and Pt were as follows: Ht were 176.3±7.4cm (SW) and 162.2±6.8cm (Pt) (p<0.05); BW 120.1±19.2kg, 83.9±17.8kg (p<0.05); BMI 38.8±7.0kg/m², 31.9±6.0kg/m² (p<0.05); %BF 29.3±5.7%, 35.2±9.9% (n.s.); WC 121.3±10.0cm, 102.5±13.8cm (p<0.05); waist/height ratio 0.69±0.07, 0.63±0.08 (n.s.); Lean body mass (LBM) 84.0±8.6kg, 52.9±6.8kg (p<0.05), respectively. These revealed that SW and Pt were obese due to visceral fat similarly. Results of blood lipid levels in SW and Pt were as follows: TC 177±34mg/dl (SW) and 209±36mg/dl (Pt) (n.s.); HDL-C 47.3±12.2mg/dl, 39.8±8.6mg/dl (n.s.); atherogenic index 2.92±1.01, 4.48±1.63 (p<0.05); TG 122±101mg/dl, 187±163mg/dl (n.s.), respectively. Results of serum enzyme levels in SW and Pt were as follows: AST 30.1±9.1IU/l (SW) and 49.5±14.5IU/l (Pt) (p<0.05); ALT 47.5±21.3IU/l, 110.2±50.1IU/l (p<0.05); gamma-GTP 43.9±20.8IU/l, 77.2±62.6IU/l (n.s.), respectively. Results of levels of another blood chemical test in SW and Pt were as follows: BG 84.1±5.9mg/dl (SW) and 107.0±20.9mg/dl (Pt) (p<0.05); UA 7.3±1.9mg/dl, 7.9±1.0mg/dl (n.s.), respectively. These imply that SW might have not become the atherogenic and hyperglycemic state. It indicated that SW were not worse state than Pt concerning lipid and carbohydrate metabolism. Results of RGA in SW and Pt were as follows: peakVO₂ 4086±361ml/min (SW) and 2074±349 ml/min (Pt) (p<0.05); adjusted peakVO₂ of BW 35.07±5.95ml/min/kg, 25.27±4.87ml/min/kg (p<0.05); adjusted peakVO₂ of lean body mass (LBM) 49.24±5.73ml/min/kg, 38.63±3.75ml/min/kg (p<0.05); MLOR 717.6±123.6mg/min, 260.3±73.1mg/min (p<0.05); adjusted MLOR of BW 6.07±0.82mg/min/kg, 3.27±1.27 mg/min/kg (p<0.05); adjusted MLOR of LBM 8.58±1.18mg/min/kg, 5.06±1.67 mg/min/kg (p<0.05), respectively. Results of abdominal CT scanning or MRI in SW and Pt were as follows: AVF 171.1±58.1cm² (SW), 133.8±44.3cm² (Pt) (n.s.); ASF 483.0±121.8cm², 289.8145.6cm² (n.s.); AVF/ASF 0.37±0.13, 0.58±0.31 (p<0.05), respectively. These revealed that CPF and the function of lipid metabolism were superior in SW than in Pt. Though BC in SW and Pt were obese similarly, CPF and lipid and carbohydrate metabolism between both groups were fairly different, and of course in SW better than in Pt.

Key words: Sumo wrestlers in university. Cardiopulmonary Function. Lipid Metabolism. Body Composition.

Measurement of the plantar support in the athletes by means Parotec® system

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Introduction: Pace study plays an important role in the athletes' biomechanics assessment.

Our research focused on a simple pace survey using a monitored insoles system, Sistema Parotec®. This system allows us to study the static and dynamic plantar pressures, both, in the research laboratory and outdoors.

Material and methods: The static and dynamic plantar pressures (walking and running) were investigated from 9 sportsmen with homogenise anthropometrics characteristics. They all do recreational long-distance athletics a minimum of 3 times a week.

None of the 9 athletes showed structural alterations when examined or were wearing the insoles for the race. We used 95 % confidence (p < 0.05) t-student to qualitatively evaluate our results.

Results: No statistical differences were found in the plantar pressures between the athletes (p>0.05). The plantar pressures increased significantly when walking and running respect to the static measurement in every sensor and both feet (p<0.05). This increase was more prominent in sensors located in the internal foot side (p<0.05).

Conclusions: Our work shows that there are significant differences between the static and dynamic measurement in the plantar pressures of the athletes although the pressures were similar. Athletes were mainly pronators according to their plantar pressures. However, the podiatric exploration showed that the plantar support was normal.

The dynamic study provides advantages compared to the static one as the plantar support anomalies not found in the podiatric exploration were detected.

Key words: Plantar support. Athletes.

"Questionnaire" for detection of early signs of overtraining": adjustment and evaluation in Mexican athletes

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Increase in physical performance is the result of the balance between the super-compensation cycle and its alteration due to the disproportionate application of training loads giving rise to an overtraining syndrome. The semiologic complexity of this syndrome does not allow us to clearly identify clinical pathognomonic sign, the French Society of Sport Medicine proposed in the year 2000 a questionnaire as an initial instrument to detect the early signs of this syndrome.

Objective: The purpose of this study was to adapt the questionnaire for the detection of early signs of overtraining and to evaluate the reliability and validity of the instrument in Mexican athletes.

Methods: The 54 dichotomic items of the questionnaire were translated and adapted the Spanish language and it was applied to 307 Mexican athletes of competitive level, both sexes. Cronbach's alpha was used to evaluate reliability and the ANOVA test for validity. Linear regression was used to evaluate the distribution of frequencies in function of the scores.

Results: Cronbach's alphas above 0.7 (p<0.05) were found in the whole questionnaire and by factors (physiological, psychological and fatigue). There was no significant difference between the means scores corresponding to each of the factors from the instrument, so there was not a specific contribution of any of them to the total score. The adjusted linear regression of the distribution of frequencies by scores, showed a negative logarithmic equation.

Conclusion: The adapted instrument has a high global reliability when used in Mexican athletes. Taken into account the distribution of frequencies, the cases with scores considered as alarm signs of overtraining were isolated among the population of study. The reliability derived from the instrument does not exempt it for the evaluation of its sensitivity and reproducibility for the confirmation of positive cases to the syndrome.

Key words: Overtraining syndrome. Mexican athletes. Reliability. Questionnaire validity.

Arterial oxygen saturation and pulse rate: diagnosis and prediction of susceptibility to acute mountain sickness

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Introduction: High-altitude illness is a growing concern in sports medicine; symptoms usually manifest immediately after reaching high altitude, before acclimatization. As the popularity of extreme sports, such as trekking, is increasing, so is the incidence of complications arising from sports activities at high altitu-

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des. The most common illness associated with high-altitude, that can be as low as 2,000 m, is acute mountain sickness (AMS); AMS is usually self-limited but can progress to the more severe and potentially fatal complications of high-altitude cerebral and pulmonary edema, consequent to fluid shift from intravascular to extra vascular space in the brain and lungs. While acute mountain sickness (AMS) symptoms have been extensively studied, susceptibility to AMS has received much less attention. Ability to evaluate AMS risk in subjects undergoing high altitude sports could be invaluable especially in not acclimatized and/or untrained subjects. Previous studies verified that AMS is due, at least in part, to impaired gas exchange; our hypothesis is that those individuals with exaggerated hypoxemia at high altitude would be more likely to develop AMS. We monitored arterial oxygen saturation (SaO₂%) and pulse rate (PR) in individuals at rest, during pauses along the climbing of Aconcagua Mountain (from 2716m to 6962 m). Moreover, at the same time test subjects were required to fill the Lake Louise Consensus Questionnaire to assess presence and severity of AMS.

Methods: 149 individuals (range: 18-66 years old) were monitored; 143 stopped their trekking at base camp (4350m) while 6 alpinist climbed the Aconcagua Mountain. SaO₂% and PR were measured using finger pulse oximetry (Pulsossmetro MP-110 Plus, Mekics Co). Presence and severity of AMS was based on the Lake Louise Consensus Questionnaire score. Statistical analysis: the occurrence of AMS was fitted by means of a logistic regression model that included SaO₂%, PR and their interaction.

Results: The majority (67%) of individuals that stopped to the base camp had no AMS symptoms (LL score: <2). Among those who presented AMS symptoms, there were all 6 alpinists that climbed to the mountain top. AMS score was related to high PR (PR: p=0.004) and low SaO₂ (SaO₂%; p=0.047); the correlation was even more significant if both variables were tested together (PR and SaO₂ p=0.005).

Conclusions: Our data suggest that low SaO₂% values and high PR at rest are associated with higher AMS score (more severe symptoms); their use in monitoring participant during high altitude sports could be useful to predict AMS risk. Further data analysis is needed to fully evaluate the role of PR and SaO₂ as indicator of AMS risk.

Key words: Lake Louise Score. Oxygen saturation. High altitude. AMS.

A multifactor approach in following up the training process of professional soccer players

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Introduction: The soccer game is a high intensity and an intermittent type of physical loading by activating all metabolic pathways of energy production. The super compensation could not happen, leading to one or several sprints of overtraining. It is necessary to follow-up many parameters (body composition, indexes of nutrition, functional parameters, blood lactates, biochemical parameters, hormones) in evaluation of effects of training process.

The aims of this study are: to evaluate the influence of separate phases of the soccer training process on some physical, nutritional, hormonal and biochemical parameters in professional soccer players; to evaluate the differences of mentioned parameters between separate phases of training process and their correlations; to evaluate the relationship between one depended and several independent parameters in evaluation of the effects of soccer training process.

This study included 30 professional SOCCER players from one of the teams of the first soccer league. The investigations are made at three points: in the beginning of the preparation period, after the preparation period, and after competition period. Each of the investigations is performed in three phases. The following parameters have been determined: muscle and fat component and indexes of nutrition (fat and muscle surface of upper arm and BMI) with anthropometric measurements and adequate predictive formulas; VO₂ max and heart rates during maximal ergometric test; AnT (km/h and beat/min) with Conconi method; blood lactates during maximal ergometric test and during high intensity football training; before and after maximal ergometric test, venous blood is taken and concentration of testosterone in serum and concentration of cortisol and ACTH in plasma are detected by RIA method; plasma concentrations of free radicals, creatinine kinase and K⁺ are detected by DEROM method.

The significant changes of some parameters and their correlations indicate adaptation and depletion of the adaptation mechanisms at the end of half season. The significant increasing of VO₂max, decreasing of creatinine kinase exercise

response and the lower levels of blood lactates after preparation period indicate a beginning of adaptation of some systems, although there is no increase of AnT and cortisol exercise response as signs for getting sports form. The proposed model offers more profound analysis of the training process effects, although for detecting the overtraining syndrome other tests (specific football and psychological) are necessary.

Key words: Football. Body composition. Index of nutrition. Functional parameters. Blood lactates. Biochemical parameters. Hormones.

SPORTS MEDICINE-III

Evaluation of α -actin after high-level competition match

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Objective: To study the effects of high-level matches on serum alpha actin and other muscle damage markers in teams of rugby and handball players.

Methods: Blood samples were drawn from 23 sportsmen: 13 rugby players and 10 handball players. One sample was drawn with the player at rest before the match and one immediately after the match. Immunoassays were used to determine troponin I, troponin T, LDH, and myoglobin concentrations. Western blot and densitometry were used to measure α -actin concentrations. Muscle injury was defined by a total CK value of > 500 IU/L (Rosalki method).

Results: Mean pre- and post-match serum alpha-actin values were, respectively, 7.16 and 26.47 μ g/ml in the handball group and 1.24 and 20.04 μ g/ml in the rugby team. CPK, LDH and myoglobin but not troponin I levels also significantly differed between these time points.

Conclusions: According to these results, large amounts of α -actin are released into peripheral blood immediately after intense physical effort. Possible cross-interference between skeletal and cardiac muscle damage can be discriminated by the combined use of α -actin and troponin I. The significant increase in alpha-actin after a high-level match may be a reliable marker for the early diagnosis and hence more effective treatment of muscle injury.

Key words: α -actin. Muscle injury. Competition match. Immunoblotting.

Body composition at football players

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Introduction: The body composition is a very important parameter to evaluate the physical training level at sportsmen and to establish the capacity of athletics' performance.

Objective: The aim of our study was to compare on the one hand the body fat and bone mineral density during pre-season (first period) and after the off season break (second period) at professional football players and on the other hand the values that had been obtained to the ones of non-athletic young males, thus, to create a profile of physical features in professional football players.

Material and method: The study was made on twenty two male athletes with an average age of 20 years from a professional football school underwent for a period of one year, the determination of body fat mass and bone mineral density (BMD) during pre-season and after the off season break.

We used the skin fold thickness over five sites to measure the body fat mass and DEXA (energy X-ray absorption) to assess the BMD.

Results: From skin fold thickness measurements it was found that body fat mass was higher immediately following the off season break (11,4%) than pre-season (10,2%).

The first period 'bone mineral density average value was higher (1,38g/cm²) than the one of the second period (1,33g/cm²).

The BMD average in football players was well above non-athletic young males' average (1.401g/cm² compared to 1.23g/cm²), due to training regimes involving

weight loading on the bones, while the body fat mass at the two groups was not significantly changed.

Conclusions: So, the physical activity influences positively the body composition, implicitly the sportive performances.

Key words: Professional football players. Non-athletics young males. Body fat mass. Bone mineral density. Skin fold. DEXA.

Injuries of U-14 Japanese national football training camp

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Introduction: We supported Under-14 years-old Eastern Japan National football training camp for 5 days. We report injuries during the camp.

Methods: One hundred and forty-one elite Japanese football players joined for the camp. We had medical support all days. We checked the number of players who received medical support, the reasons of their injuries, their positions and their injured parts of body.

Results: Forty-eight players received medical support. The reasons are below: Traumas were 20. Disorders were 17. Internal medicines (abdominal pain and/or febrile attack) were 8, which included 2 flu. Others were 3. Traumas most occurred at the second day, while disorders and internal medicines most occurred at the third day of camp.

Discussion: Many players received medical support during only five days short-time training camp. Further, some players had been injured before the training camp started. Furthermore, not only injuries but also internal medicines occurred. So, we had to take care all the problems. We also consulted outside hospital to examine and/or treat the players, if needed. Every day we had to discuss coaches to evaluate their conditions and decided next day's training menu or who had to keep rest individually. After the camp, we asked the belonging teams to continue treat and care for the injured players. It is important for such medical support to close contact coaches and their team doctors for evaluating players' conditions and to understand characteristics of football and players for reducing problems.

Conclusions: We supported and report U-14 Eastern Japan National football training camp. As many players received medical support during even short time training camp, we had to take care injuries and internal medicines.

Key words: Injury. Football. U-14. Training camp. Medical support.

Hormone responses induced by a specific training program in youth players of primavera Lecce team

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Introduction: During training, occurs various psychical, anthropometrical and functional changes, important particularly for youth soccer. This aspect has to be considered for designing and evaluating training programs. This study evaluated cortisol, free and total testosterone and growth hormone (hGH) responses to change work loads and the effects of period training on this hormonal responses in young soccer players.

Methods: Hormonal concentrations were tested in twenty-five soccer players (mean age 17.2 years; range 16–18.5), before and after four weeks of intensive training and after twelve and thirty-two weeks of training and matches of 2007/2008 competitive season. Serum was analyzed by immunoradiometric-assay for free-testosterone and by enzymeimmuno-assay for hGH, cortisol and total testosterone. The training program consisted of aerobic anaerobic and combined training. Data analysis was performed in two parts: (1) calculation of simple correlations between the hormone concentrations and (2) evaluation of potential differences between the average correlation of the different parameters.

Results: Cortisol, free and total testosterone serum concentrations increased in the first weeks of intensive training; then showed a statistically significant ($p < 0.05-0.01$) decline for the next months of training. hGH did not change in any periods. The response pattern of the serum testosterone/cortisol ratio

was similar to the response pattern of serum testosterone: from 0.089 (0.01) at week 0 to 0.081 (0.03) at week 4, to 0.056 (0.02, $p=0.0229$) at 12 week and to 0.08 (0.02) at week 32, respectively. The changes in free and total testosterone, concentrations were correlated ($p < 0.05-0.01$) with endurance exercises and endurance speed loads; but not with alactacid anaerobic training or match attempts. In addition to resistance exercises, serum cortisol concentration was significantly correlated ($p < 0.05-0.01$) with alactacid anaerobic exercises ($p < 0.05-0.01$); but neither with combined exercises nor unexpectedly not with match assurances.

Conclusions: In conclusion, the present findings give credence to the hypothesis suggesting a linkage between the levels of testosterone and stress hormones, with respect to cortisol, dosed in youth soccer after various resistance exercise protocols. Furthermore, these different resistance exercise protocols produce distinct hormonal response patterns depending on the number of sets performed at each exercise. These results should be taken into account when trying to optimize the effectiveness of resistance training or to induce specific adaptations in the neuromuscular system with the use of different training protocols.

Key words: Androgens. Endocrine. Glucocorticoids. Training protocol. Youth soccer.

SPORTS MEDICINE-IV

Specific environmental conditions during 2008 Olympic games. Adaptative responses of the Spanish sailing team

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Introduction: During the past four years in Qingdao, the Olympic Sailing Venue for the 2008 Olympic Games, mean air temperature was around 30 degrees Celsius and relative humidity at around 90%.

Due to these extreme environmental conditions sailors' performance could have suffered and there was a greater risk of heat stroke as a result of increased body temperature.

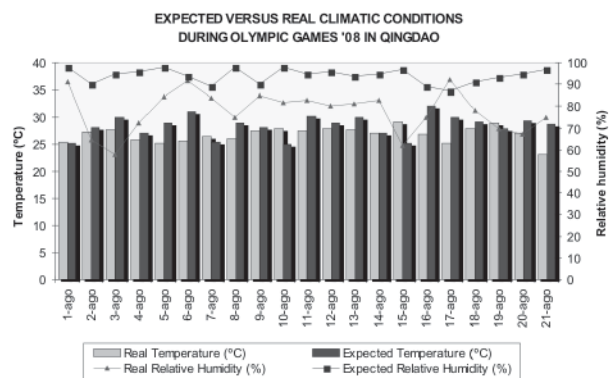


Figura 1. Vaz Pardo C, et al.

Methods:

How did Spanish Sailing Team prepare to face these extreme conditions?

1. Thermoregulatory methods (to control thermal stress and to reduce core temperature):
 - a. Accurate control of the core temperature core body temperature sensors through a radio telemetry sensor.
 - b. Precooling with ice-vests (Cryo-vest®) prior to competition and between daily races.
 - c. Hydration control using quantitative determination of specific biological parameters such as sodium, potassium, Bicarbonate, pH, haemoglobin and hematocrit, by means of a portable clinical analyzer (I-STAT).

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- Individual supervision of the quality and quantity of fluid intakes based on I-STAT results.
- Daily body weight checks before and after racing.

Results: The core temperature during racing never exceeded 39.6°C in the case of any members of the Spanish Sailing Team (in contrast to the previous year during the Olympic test event where peaks of 40.7°C were recorded).

The average variation in the sailors' body weight was 0.9±0.3 kg prior to and after racing. We could therefore deduce that sailors suffered no significant dehydration despite hot and humid environmental conditions.

Conclusions: During the Olympic Games of 2008 in Qingdao, the Spanish Sailing Team, made up of 16 sailors, was able to maintain thermal balance despite the adverse environmental conditions.

- Primarily due to the sailors undergoing a good adaptation process to the hot and humid climate by means of the methods adopted.
- Secondly, as the environmental conditions during the Olympic Games were not as severe as expected:
 - Mean temperature 26.9°C.
 - Mean relative humidity 77.8%.

Key words: Sailing. Environmental Conditions.

Which is the reality of the sports medicine speciality?

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Purpose: Knowing if the graduates' initial prospects are fulfilled after having taken this speciality.

Design: Cross-sectional descriptive study in an urban area in Spain.

Patients: 25 Sports Medicine former residents of class 2001-2004.

Material and Method: Telephonic survey to former residents with 5 items: Why they chose this speciality; present occupation; satisfaction level (1-6 from not satisfied to very satisfied); which were their goals; given their current experience how they would improve their speciality.

Results: Out of 25 subjects, 5 (20%) were not included as they were not located by telephone. 20 patients participated in the survey, among which a 64.3% IC 95 (35,1-87,2) were women of an average age of 35 (30-45 years old). We find that 64.3% IC (35,1-87,2) chose the speciality as a first choice, 14.3% (1,7-42,8) for mark raising or to take any speciality, and 1 because it was the only speciality with vacancies. At present 78,6% (49,2-95,3) work in Sports Medicine, but 50%(23-77) of them have also another job. The level of current satisfaction is low. It shows an average of 3,4 (1-6 from not satisfied to very satisfied).

Most of the graduates' goal was to link themselves to Sports Medicine through private consultation, sport units in hospitals or outpatient clinics so that it allowed them to earn their living.

Given their current experience, 90% would improve their speciality by making residency to be an in-hospital speciality instead of a school speciality; getting more recognition being able to integrate into outpatient clinics as well as into hospitals and gaining access to more courses of continuous training.

Conclusion: The majority of this class chose the speciality as a first choice; many have been able to work in this speciality but the great majority of them have to take other jobs. The satisfaction level is low. Their initial prospects have not been fulfilled.

The majority proposes as an improvement that this speciality should get more recognition through its integration in hospital training. At the same time, an offer of more continuous training courses is needed.

Key words: Job goals in sports medicine. Promotion prospects in sports medicine.

Can be evaluated the capacity of reaction of the sportsmen?

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The acoustic startle response (ASR) is a defensive behaviour, composed of a series of rapid phasic contractions of the skeletal muscles throughout the body and

elicited by sudden loud sounds, and this reflex, is one of the fastest movements of human beings in response to a sensory stimulus.

One of the most interesting modulations of the acoustic startle reflex is the prepulse inhibition (PPI), that consist in the reduction in magnitude of the startle reflex produced by a weak nonstartling stimulus (acoustic, visual, or tactile prepulse) presented 20-800 ms before the startle stimulus.

The ASR may be modified quantitatively or qualitatively by a range of natural and experimental conditions, a feature that reflects the plasticity of this reflex.

The ASR and the PPI analysis is increasingly used as a tool for measurement of changes incurred during the processing of sensorimotor information in mammals, that follow spontaneous or induced alterations of the nervous system.

To study the relationship between the people that develop sport training and the improvement of the startle reaction, we carried out a comparative study of the ASR and the PPI under control and sportmen. The ASR was measured in 23 consenting adults from 18 to 26 years old, 13 of them woman belong to the same sporting club of handball, and 10 woman non-athlete controls.

The trial used consisted in a 3 stimuli series of 100 Hz, 50 ms and 100 dB, which occurred randomly every 10 minutes approximately. Movements were recorded by means of the electromyographic activity of the muscles orbicularis oculi and mentalis. In addition, the brainstem auditory evoked potentials were measured to evaluate the statement of the afferent auditory pathway.

Analysis of the results shows a decrease in the latency of response and an increase in the amplitude of response in sportwoman related to the controls. Related to the PPI, there is not differences between controls and sportwoman.

In some way, the training has improved the startle reaction.

Although we need more studies to probe our hypothesis and there is not final conclusions, our preliminary finds arise a potential importance to the ASR sports as a diagnostic tool in the evaluation of the capacity of reaction of the sportman.

Grant sponsors: #BFU2007-65210 and JCYL#SA007C05

Key words: Startle-response. Prepulse-inhibition. Sportman.

Use of anabolic steroids improves recuperation of distal biceps rupture post operatively

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Introduction: Acute distal biceps rupture consists a rare but devastating injury to the athlete. It occurs in the dominant extremity of athletes during excessive eccentric tension as the arm is forced from a flexed position and it is mainly observed during sport activities including high resistance or full body contact. The use of Anabolic Steroids (AS) may have a considerable effect on the healing process after surgery.

Methods: We conducted an observation study of 9 male athletes with 10 distal biceps tendon ruptures. Six of these athletes were users of (AS) (Group A) the rest comprised Group B. Average age at injury was 41 years. In average, surgery was performed within five days. All groups were treated with the single incision technique with two suture anchors. All followed the same post-operative recuperation and rehabilitation protocol. Patients underwent follow-up a minimum of 8 months after surgery, with the average being 19 months. Outcome was evaluated based on the Mayo Elbow Performance Score, physical examination, isokinetic testing of strength, endurance of flexion and supination, and radiographic analysis.

Results: Early evaluations show that Group A had faster and better recuperation than Group B. All Group A athletes scored higher than their Group B counterparts on all evaluations. On follow up, we found a slight flexion-extension deficit in one Group B athlete, reduced supination in two and reduced pronation in one athlete from the same Group.

Conclusions: The results of our study suggest that there is a direct correlation between the use of AS and the quicker and better recuperation and rehabilitation observed in Group A.

Key words: Anabolic steroids. Distal biceps brachii. Tendon rupture.

Upper extremity injuries associated with high resistance training and anabolic steroid abuse

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Introduction: High resistance training is usually associated with numerous injuries that are more common on the upper extremities. We investigated the association of the injury patterns and Anabolic Steroids (AS) use.

Methods: We studied a cohort of 320 athletes that included 160 AS users (group A) and 160 non users (group B). Generalized questionnaires were used to identify and stratify AS users and categorise all upper extremities injuries observed in the cohort in general. Our purpose was to explore any correlation between AS use and upper body injuries during high resistance training. The data provided by the questionnaires evaluation were categorized and elaborated.

Results: Most injuries sustained during strength training were mild strains that resolved with appropriate rest. More severe injuries included traumatic shoulder dislocations, tendon ruptures of the pectoralis major, biceps, and triceps; stress fractures of the distal clavicle, humerus, radius, and ulna; traumatic fractures of the distal radius and ulna in adolescent weightlifters; and compressive and stretch neuropathies. Comparison of incidence between the two groups showed a statistically significant difference in favour of group A. Group A athletes suffered less injuries (in general) than their group B counterparts and even those that were injured showed a greater rate of recuperation. All data are presented in tabulations and graphs for better understanding.

Conclusions: Our study suggests a correlation between the lower incidence of injuries during strength training and use of AS.

Key words: Anabolic steroids. Injuries. High resistance.

SPORTS MEDICINE-V

Stress fracture of sesamoid of the hallux: case report

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In this paper we present the conservative management of a stress fracture reported during the training period preceding the Olympic Games.

A twenty-eight year-old female fencer reported a stress fracture of the medial sesamoid of the hallux of the right foot at the end of January 2008, after a week of intense training with the National team.

The fencer complained of intense pain in the area of the first toe with impossibility of walking and maintenance of the standing position.

The radiograph (RX) suggested a stress fracture of the medial sesamoid which was later confirmed by Magnetic Resonance Imaging (MRI).

The patient had not yet qualified for the Olympics Games therefore it was necessary that she participate in the World Cup competitions, so a conservative treatment was carried out, consisting in:

1. Interruption of training;
2. Modalities (Ultrasound, Iontophoresis and Laser) for analgesy;
3. Magnotherapy for 8 hours/day to promote the consolidation of the fracture;
4. Wearing a walk-able type plantar orthosis with weight dispersion of the first metatarsal head and perisemoid ogive;
5. Hydrokinesitherapy daily sessions for approximately 90 minutes, with the purpose of maintaining the sporting movements in water, without weight bearing stress;
6. Rehabilitation daily sessions in the gymnasium for approximately 2 hours, with the purpose of maintaining the muscular and metabolic conditioning;
7. Five sessions of extracorporeal shock wave treatment (low energy shock waves produced with a specific device: Minilith SL1, from Storz Medical AG. An in line eco system was used to aim the target). This one was stimulated to obtain a re-start of the calcifying processes.

The painful symptomatology was resolved in one week. 40 days after the fifth shock wave session.

RX and MRI were carried out which indicated the consolidation of the stress fracture.

The athlete returned to her practice of fencing after 12 weeks of rehabilitation. She was able to participate without problems in some World Cup competitions

thereby qualifying for the Olympic Games in which she regularly participated. She has remained symptoms free for the last six months.

Conclusion: Conservative therapy of a stress fracture of the sesamoid bones of the hallux can allow an elite athlete to briefly interrupt their competitive season only by adopting a global therapeutic approach, which combine different modalities and rehabilitation techniques with the application of an orthosis and with rehabilitation exercises performed in gym and in pool aimed to maintain the physical fitness of the athlete.

Key words: Stress fracture. Conservative treatment. Fencing.

Effects of concussion on balance ability in Japanese College American football players

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Introduction: Concussion is one of the most frequent injuries in American football. In Japan, not all football players have opportunities to receive a daily support from doctors or athletic trainers. Therefore, the players participate in practices and games without appropriate treatment against concussion. The purpose of the study was to investigate effects from sports related concussion on balance ability in Japanese football players.

Methods: Twenty college American football players at H University, Japan participated in the current study. Concussion group was 9 players (21.0±1.50 years of age), who had history of grade 2 to 3 concussion and/or recurrent concussions more than 3 times in criteria of American Academy of Neurology. No concussion group was 11 players (20.5±1.03 years of age), who had no history of concussion and severe injury in the lumbar and lower extremities. Participants with an American football helmet stood still for 20 seconds with eyes open and closed. Two video cameras were used to record the movement of the crown of the head. The movement was three dimensionally digitized by a software, Frame-DIAS IV (DKH Inc., Tokyo, Japan). Independent t-tests were used for statistical analyses and the level of significance was set at $p < .05$.

Results: There were statistical significances between the concussion and no concussion groups with eyes closed in the total traveling distance, and medial-lateral and superior-inferior displacements ($p < .05$). No significance was found in conditions with eyes open.

Conclusion: The current study suggested that severe and multiple concussions in Japanese college American football players caused long time adverse effects on their balance ability. Coaches and athletic trainers should continuously monitor concussed players without the symptoms.

Key words: Concussion. Balance. American Football.

Morphofunctional characteristics of young elite male handball players

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Objectives: Specific morphology and functional characteristics of athletes are very important prerequisite for successful sport pursuing. The aim of this study was to examine middle values of anthropometric and functional parameters in our young elite male handball players and to analyze their specificities i.e. the probable variation between the four playing positions (goalkeepers, back court players, wings, pivots).

Method: The sample in the present study comprised 32 elite male handball players age 19,3 (±1,3) years, and with sport probation 8,3 (±1,9) years. Body composition (BMI, percentage of body fat (%D), muscle (%M) and bone (%O)) was calculated by measuring body weight, body height, 6 skinfold thicknesses, 4 limb circumference, and 4 joint diameter. Vo2max was estimated by Astrand's test on ergobicycle.

Results: Average value of BMI was 24,32kg/m², percentage of body fat (%D=13,79%), muscle (%M=50,32%), bone (%O=16,72), and VO2max was 3,40l/min (39,67ml/kgmin). Goalkeepers were found to be the tallest players, and they had the largest fat skinfolds and the highest fat percentage, but their aerobic capacity was the lowest. The players on wing positions had the highest percentage of body muscles, and pivots had the best aerobic capacity.

Conclusion: We may conclude that anthropometric and functional differences exist among handball players who play in different positions. These differences fit with their different workload in a game. Therefore, training programs should include specific sessions for each positional role.

POSTER COMMUNICATIONS

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Key words: Males, Junior, Handball, Morphofunctional aspects.

Incorrect posture and the status of feet in female volleyball players in younger age groups

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Introduction: Doctors in Croatia frequently recommend girls with kyphotic and scoliotic incorrect posture to train volleyball. The reason for this is probably overhand pass (handled with fingertips) as one of the volleyball techniques which is thought to have corrective effect due to symmetrical raising of arms above head. However, overhand pass is just one of the volleyball techniques, and some of the most intensive movements in volleyball are asymmetrical (smash, jump serve). Certain volleyball players perform these movements during a training or a match dozens of times. Apart from this, in underarm pass a volleyball player stresses kyphotic posture. As a consequence, the children who were recommended a certain activity (overhand pass above head) which can have a positive influence on incorrect posture, frequently perform other activities which may have a negative impact and additionally deteriorate incorrect posture. The aim of this research is to establish the number and type of incorrect postures and the existence of significant differences in young female players aged between 8 and 16, divided in three subsamples.

Methods: Posture measuring and the assessment of fallen feet arches has been done on the sample of girls aged from 8 to 17 divided in three subsamples (group 1 – aged 8-10, group 2 – aged 11-13, group 3 – aged 14-16). Examination and assessment of posture was accomplished by a measuring instrument with the usage of photographing of the sagittal and frontal posture and data were processed by a computer programme called Posture Image Analyser. The status of feet was assessed by the plantography method and the footprint was processed by a method through five fields. We have measured the frequencies and percentages of all obtained degrees of fallen feet arches as well as the obtained types of incorrect posture, and through chi square test, we established the existence of statistically significant differences between the obtained frequencies and percentages in certain subgroups.

Results: The obtained results of fallen feet arches (Table 1) show that 75-78% of girls have a flat left or right foot. The largest number of girls has 2° of flatness (pes planovalgus). Chi square test does not prove any significant differences between the degrees of flat feet in subsamples. In postural incorrectnesses (Table 2), chi square test proves the existence of significant differences between the obtained frequencies and the percentage of types of incorrect postures in three subsamples. The total sample shows most left thoracic scoliotic postures (38.1%). It is evident the second group of girls displays the largest percentage of every single incorrect posture type. This age group (11-13) brings noticeable changes

in girls' organisms. The consequences of rapid growth and development phase may have a negative influence on the unprepared organisms in girls resulting in deterioration of static-dynamic relations as well as in development of different incorrect postures. The third group of girls revealed no lordotic incorrect postures whatsoever, while in the first two groups it was observed in 6 cases. This may lead to a conclusion that girls in the third group being younger under-sixteens and undergoing more serious trainings including conditioning trainings, have additionally strengthened abdominal muscles and thus having corrected or prevented lordotic posture.

Conclusion: Given all the facts, playing volleyball as an asymmetrical sport dominated by skills such as smash, serve, can have a negative influence on girls' organisms, particularly in those going through extremely sensitive adolescent age.

Key words: Posture. Volleyball. Girls.

Injuries in rhythmic gymnastics. Experience of a lifetime sport

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Objective: To know the experience of sports injuries suffered by gymnasts along her sport life.

Material and method: As source of data has been used an anonymous questionnaire that was distributed among the participants in a course of rhythmic gymnastics coaches. All of them were gymnasts and even some continued active. In the questionnaire had general questions about her sports experience, the injuries suffered along her sports life and the impact of these on their health.

Results: There was obtained a sample of 54 completed questionnaires. The middle ages were 18,6 years. The average age of sports beginning were of 8,3, ranging from 5 to 13 years. Of them, 31 (58 %) already was not competing and the rest they were continuing doing it. As a whole they supposed 592 years of sports experience.

To the question of if they had suffered some injury, 49 of them (90,8 %) answered affirmatively and only 5 did not have injuries, of which 4 were still active. Altogether said to have suffered 404 injuries (8 for gymnast of average), the most frequent muscle injuries (34.6%) followed by sprains (25%). The most common location was lower limb (51%) followed by back (33%).

The sports injury was the cause of the sports abandon in 25,8 % of gymnasts who had finished his sporting life. In 29 cases, 53% of the total cases, they said to have sequels of sports injuries.

On if they were thinking that the sport is good for the health, they all answered affirmatively, but about the competition sport, 21,7 % was thinking that not.

Conclusions: There has been obtained information about the sports injuries at the end of the stage of competition, emphasizing the great number of sportswomen who suffer injuries and the negative impact of these.

Key words: Injuries. Rhythmic gymnastics. Sport.

Table 1. Paušić Jelena, et al. Frequencies and percentages with chi square test for three groups of young volleyball female players – pes planus degrees

Group	Left foot				Right foot			
	normal	1°	2°	3°	normal	1°	2°	3°
1 st F(%)	1 (5%)	2 (10,0%)	11 (55%)	6 (30%)	2 (10%)	0 (0%)	15 (75%)	3 (15%)
2 nd F(%)	3 (4,7%)	4 (6,2%)	53 (82,8%)	4 (6,2%)	7 (10,9%)	5 (7,8%)	45 (70,3%)	7 (10,9%)
3 th F(%)	1 (3,3%)	0 (0%)	25 (83,3%)	4 (13,3%)	1 (3,3%)	1 (3,3%)	26 (86,7%)	2 (6,7%)
Total	5 (4,4%)	6 (5,3%)	89 (78,1%)	14 (12,3%)	10 (8,8%)	6 (5,3%)	86 (75,4%)	12 (10,5%)

Pearson Chi-Square=11,346 df=6 p=0,78; Pearson Chi-Square=4,983 df=6 p=0,55

Table 2. Paušić Jelena, et al. Frequencies and percentages with chi square test for three groups of young volleyball female players – Types of incorrect posture

Group	Normal	Right scoliosis	Types of incorrect posture			Total
			Kyfo-lordosis	Left scoliosis	Lordosis	
1 st F(%)	6 (27,3%)	0 (0%)	2 (9,1%)	8 (36,4%)	6 (27,3%)	22 (100%)
2 nd F(%)	23 (35,9%)	10 (15,6%)	0 (0%)	25 (39,1%)	6 (9,4%)	64 (100%)
3 th F(%)	16 (50,0%)	4 (12,5%)	0 (0%)	12 (37,5%)	0 (0%)	32 (100%)
Total	45 (38,1%)	14 (11,9%)	2 (1,7%)	45 (38,1%)	12 (10,2%)	118 (100%)

Pearson Chi-Square=23,71 df=8 p=0,03

SPORTS MEDICINE-VI

Assessment of tethered force in a trained uni-lateral leg amputee swimmer

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Evaluating propulsive force has been an area of great interest in competitive swimming. One of the methodologies to assess propulsive force is tethered swimming, which is considered a valid and reliable test (Kjendlie and Thorsvald, 2006). Being used more frequently since the 1970's (cf. Magel, 1970), tethered swimming is being used nowadays even in training control and evaluation of elite swimmers (Morouço, *et al.*, this symposium). Complementarily, competitive swimming for persons with a disability is an emerging area of scientific interest. In this sense, the aim of the present study was to analyze and compare the force

production obtained through a tethered swimming test in a swimmer without disabilities and a unilateral leg amputee swimmer.

Two trained male swimmers performed the 30s tethered swimming test for force production assessment as described before (Morouço *et al.*, 2008). Both swimmers were involved in regular practice of 6 training units per week. Their main characteristics are presented in Table 1.

After a 1200m warm-up, each subject performed a 30s maximum intensity front crawl tethered swimming test. Individual force to time - F(t) - curves were obtained in order to assess: absolute mean (AbsF_{mean}) and peak (AbsF_{max}) force, relative mean (RelF_{mean}) and peak (RelF_{max}) force (divided by body mass), fatigue index (Fat_{ind}) and coefficient of variation (%CV). Additionally, the lactate production (Δ[La-]) was determined as the difference between the maximal values measured in the final of the test and those measured after the warm-up. Ten days after the experimental protocol, each swimmer was involved in a 100m freestyle event, in order to obtain their performance indicators, as shown in Table 2.

In Figure 1 (A and B panels) it is possible to observe the tethered swimming curves obtained, evidencing the decrease of force production along the 30s effort. Results pointed out differences in force production of the two subjects. The leg amputee swimmer presents higher values in maximum force production associated with a higher %CV and the swimmer without disabilities has higher average force production aligning with the best performance in 100m free swimming. Tethered swimming can be a helpful methodology to evaluate force parameters of swimmers disability in order to improve their specific technique.

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Key words: Swimming. Disability. Biomechanics. Strength.

Table 1. Mourouço P, *et al.* Individual values of the swimmers physical characteristics

	Age (years)	Height (cm)	Body mass (kg)	Arm span (cm)	Surface area (m ²)
# 1 (amputee)	20.6	168.0	56.0	183.0	1.61
#2	15.4	171.0	61.0	176.0	1.64

Pearson Chi-Square=11,346 df=6 p=0,78; Pearson Chi-Square=4,983 df=6 p=0,55

Table 2. Mourouço P, *et al.* Individual values of each variable studied in both swimmers

	AbsF _{mean}	AbsF _{max}	RelF _{mean}	RelF _{max}	Fat _{ind}	%CV	t100F	Δ[La-]
# 1 (amputee)	80.9	256.1	1.45	4.57	44.0%	74.3%	68.9	6.8
#2	87.6	252.9	1.44	4.15	55.9%	65.2%	59.2	8.0

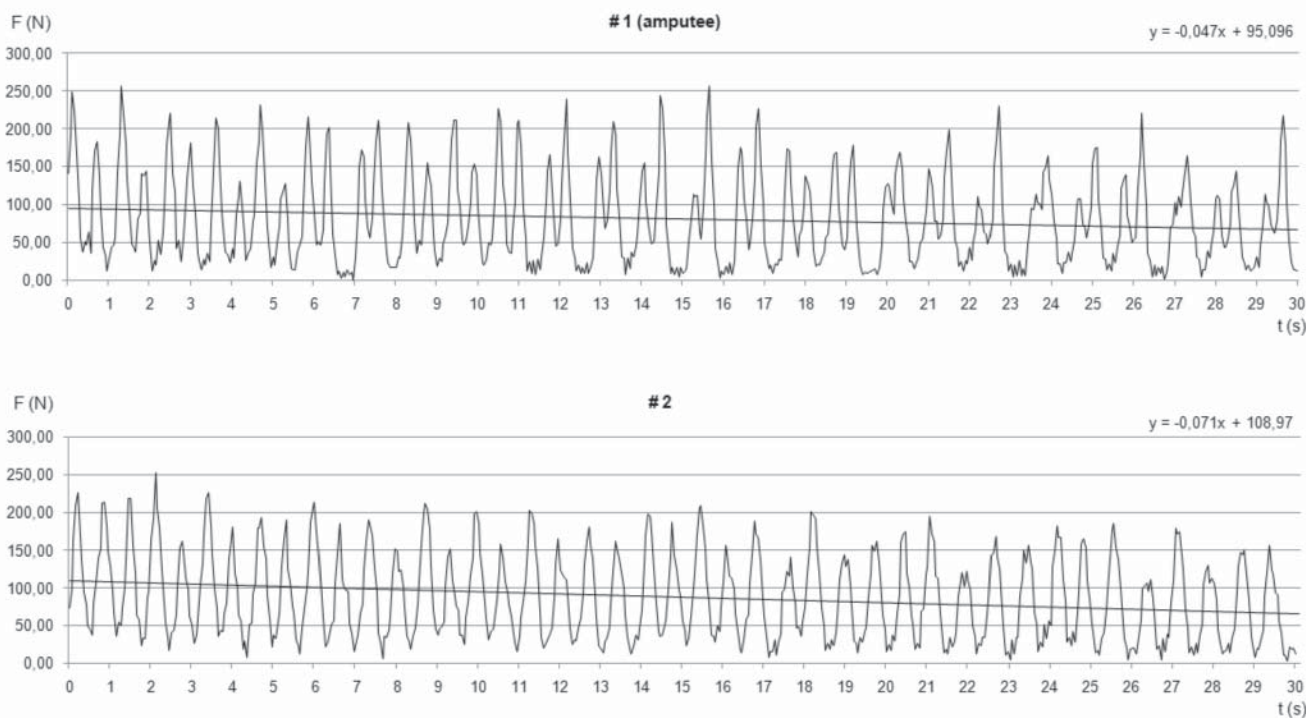


Figure 1. Mourouço P, *et al.* Tethered swimming curves obtained in the amputee and “normal” swimmers

Predictors of adherence to a supervised exercise program prescribed by primary health care professionals

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Introduction: The importance of exercise for health is now well-established. Regular physical activity produces benefits to patients with obesity, hypertension, dyslipemia, diabetes mellitus type 2 and sedentarism.

Identifying predictors of exercise behavior could allow researchers and practitioners to effectively structure intervention that maximize program adherence.

The present study examined whether specific participant characteristics (age, sex, cardiovascular risk factors...) predicted adherence to the supervised exercise program, included in the pilot intervention of Physical Activity, Sport and Health Plan (PAFES) of Catalonia.

Materials and methods: Supervised exercise program was prescribed from primary care professionals to patients presenting one or more cardiovascular risk factors (obesity, hypertension, dyslipemia, diabetes mellitus type 2 or sedentarism). Adherence was assessed in 196 (48 male and 148 female) participants.

The exercise on prescription consisted in a supervised exercise program for adults. Session's content was mainly aerobic. The duration of the intervention was 3 months, frequency of 2 days/week, and session's duration of 60 minutes. Initially specific participant characteristics were collected on demographic, health indicators and information on chronic diseases and cardiovascular risk factors.

Throughout the intervention, there was a register of adherence by means of attendance.

Multiple lineal regression tests were done in order to find predictive models of adherence.

The variables that were used in the analysis were gender, age, smoking status, number of cardiovascular risk factors and type or cardiovascular risk factor.

Results: The analysis of regression step by step did not show significant differences between adherence and the number of cardiovascular risk factors presented by the participants (obesity, hypertension, dyslipemia, diabetes mellitus type 2 and/or sedentarism).

Despite not being statistically significant, the cardiovascular risk factor that presented a greater trend to discriminate the adherence factor was dyslipemia ($p=.072$).

Furthermore, none of the variables analyzed of the specific participant characteristics were a predictor of exercise adherence.

Conclusions: It was not possible to create a predictive model for adherence to the exercise program with the data of this pilot intervention.

Future interventions to promote physical activity should make sure that variables that have been shown to be related to adherence to exercise programs by previous researches, such as self-efficacy are collected.

Key words: Adherence. Exercise on prescription. Chronic diseases.

Plasma leptin, left ventricular function and exercise training in untrained postmenopausal women

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Leptin has shown to influence cardiovascular system through a stimulation of cardiac sympathetic nervous system activity.

The aim of our study was to evaluate the relationship between plasma leptin levels (LE), exercise training and echocardiography parameters of left ventricular (LV) function and morphology in healthy, untrained, postmenopausal women.

Material and Methods: 35 women (43-59 years old, mean 52.3 ± 3.9) underwent metabolic measurements (leptin plasma levels and fat mass) and echocardiography-Doppler examination before (PRE) and after (POST) exercise training in order to assess systolic and diastolic function. Maximal oxygen consumption (VO_2 max) predicted was determined for each subject by administering a treadmill exercise test. Subjects performed 50 minutes of walking, four times a week

at 50%-60% heart rate reserve. Exercise training lasted 12 week and Rockport Fitness Walking test was used to estimate cardiorespiratory fitness.

Results: After the training period (POST) they showed a significant increase of predicted VO_2 max, ejection fraction (FE) and midwall fractional shortening (MFS), whereas LE and fat mass (Fm) was significant lower than in pre training period (PRE). Linear regression analysis demonstrated correlations between leptin and basal values of the relative wall thickness ($p=0.02$, -0.529) and left ventricular enddiastolic diameter ($p: 0.02$, $+0.49$). MFS and FE were correlated with VO_2 max ($p=0.01$, $+0.78$). We did not find any correlation among leptin and the post training echocardiography parameters.

Conclusion: Our study demonstrates that exercise training in post menopausal women can reduce LE and improve VO_2 max and LV function. Left ventricular remodeling seem to be due to exercise training but not to the reduction of leptin values.

Table 1. Granieri M, et al.

N	Pre	Post	p
VO_2 max (ml/kg/min)	$23,9 \pm 5,1$	$33,6 \pm 5,7$	0,0001
Leptina (ng/ml)	$36,4 \pm 17,7$	$25,2 \pm 14,9$	0,0001
FM (%)	$37,9 \pm 7,6$	$36,4 \pm 7,1$	0,002
MFS (%)	$18,4 \pm 5,4$	$24,8 \pm 5,1$	0,0001
fe pre (%)	$63,7 \pm 11,3$	$73,3 \pm 8,2$	0,003

Pearson Chi-Square=11,346 df=6 $p=0,78$; Pearson Chi-Square=4,983 df=6 $p=0,55$

Key words: Echocardiography. Postmenopause. Exercise.

Design of a specific protocol to evaluate the strength of the hand muscles in sport rock climbing

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The forearm muscles, responsible for the performance in the static positions, have been the object of study for the most of researchers. 21 active subjects who practise sport rock climbing have been evaluated, organized in 2 groups of level: expert climbers (EE) with variations in the degree of performance between 7a and 8a and recreational climbers (RC) with a variable performance between 6a and 6c. It has been studied continuous and intermittent efforts of apprehension. For this, it has been built a table of multiple grips, in which stands out 5 slats with more or less surface. The test for the study of the isometric resistance consist of entering in the accounts with a digital stopwatch the maximum time in which the person in question is able to stay hold on to the slat with bigger grip surface (P1). The test of intermittent resistance consist of execute shorts isometric contractions with incomplete recuperations, going from the slats with bigger grip surface to the slats with less grip surface, making an increase of the muscular fatigue. The results of the test of the resistance of isometric strength on grip 'P1' show differences very significant between the expert groups and the recreational ones. The expert group are supported during an average of 3,03 minutes and the group of recreational during 2,06 minutes. The analysis of the work time and the number of repetitions of the test of the resistance of intermittent strength show that the expert climbers prolong the length seven minutes more than the recreational climbers, 17,57minutes vs. 10,33 respectively; in consequence, they exceed in 23 the number of repetitions (53 vs. 30). Statically it does exist differences very significant. The resistance of the hand muscles in a continuous and intermittent effort are the variables more determinants in the performance of the sport rock climbing, finding in the protocol designed for this study an objective and specific instrument of evaluation.

Key words: Strength. Climbing. Performance.

Extreme altitude climbers preserve cognitive function after physical exercise under severe hypoxia at sea level

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Introduction: The high-altitude hypoxemia is particularly severe during physical exercise.

Objective: To detect changes in basic psychological abilities after physical exercise under normobaric hypoxic test (NHT) (Figure 1), and to find possible relations with cardiorespiratory response to hypoxia.

Material and methods: Twelve male climbers, age 36.8 (6.2 SD), with previous experience at high-altitude but no-recently altitude exposed, were cognitive evaluated by means of the primary mental aptitude (PMA) of Thurstone test, both before and just after to perform the NHT of Richalet *et al.* (FiO_2 : 11.5%, simulated altitude \approx 4.800 m) for 10 minutes, 5 of them cycling at 30% VO_{2max} . By means of PMA were evaluated 4 factors of intelligence: factor V, factor E, factor R and factor N, before and immediately after NHT. To evaluate possible learning effect, PMA was also performed by 8 control male climbers, age 43.8 (5.4 SD), with previous experience at high-altitude. Altitude sickness (AS) risk was estimated by means of comparing hypoxic (H) with normoxic phases (10 minutes each one) during rest (R) or exercise (E): cardiac response (RC_E), ventilatory response (RVE), arterial oxygen saturation (SpO_2E and SpO_2R), and respiratory rate (FR_{EH}).

Results: PMA tests, with or without inserting NHT, did not shown statistical differences ($IC_{95\%}$) in all cognitive abilities between the experimental (Figure

2) and control group. Only 4 (33.3%) subjects were catalogued with high-susceptibility for AS, being the NHT data of the whole group: RC_E : 0.83 (0.19 SD) $min^{-1}\cdot\%^{-1}$, RVE : 0.70 (0.37 SD) $L\cdot min^{-1}\cdot kg^{-1}$, SpO_2E : 24.7 (6.4 SD) %, SpO_2R : 9.25 (2.96 SD) %, and FR_{EH} : 22.2 (5.9 SD) min^{-1} .

Conclusion: Non-acclimatized climbers seems to maintain basic cognitive abilities immediately after an acute and severe hypoxemia corresponding to a submaximum physical exercise at an altitude of almost 5.000 m, in spite of the hypoxic cardio-ventilatory response and susceptibility to suffer AS.

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Key words: Neuropsychology. Altitude. Hypoxia.

TRAINING AND PERFORMANCE IMPROVEMENT-I

Relations between some types of force and the speed racing in young basketball players

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In order to achieve the best results in competitions, minimal details need to be observed. The aim of this study was to verify the relation among three types of force (explosive power, isokinetic and maximal strength) and their correlation with a typical basketball movement: the speed racing. This research was approved by the Human Research Ethics Committee of Dom Bosco's College. The sample comprised 14 young male basketball players (mean age $15,71 \pm 0,99$ yrs, height $184,28 \pm 6,20$ cm, body mass $74,25 \pm 10,04$ kg, lean mass $66,40 \pm 8,28$ kg and body fat $10,39 \pm 3,30$ %) who were in the final training program, post competition. The subjects were evaluated by vertical jump (countermovement), one repetition maximum strength (1 RM) testing in 45 degree leg-press machine, isokinetic evaluation (performed by Cybex Norm, where we obtained the values of peak torque at a 60°/s speed, explosive power at a 240°/s speed and angular velocity to reach peak torque) as well as 30 meters sprint test. It was found a significant correlation between the explosive power force measured through the vertical jump test and the sprint test ($r = -0,59$ and $p < 0,05$). However, no significant correlation was found between the maximal strength measured through the 1RM test and the sprint test ($r = 0,10$ and $p = 0,71$). Likewise, no correlation was found between peak torque ($r = -0,09$ and $p = 0,74$ flexor muscle and $r = -0,3$ and $p = 0,20$ extensor muscle) and explosive power ($r = 0,07$ and $p = 0,80$ flexor muscle and $r = -0,17$ and $p = 0,55$ extensor muscle) measured through the isokinetic evaluation and the sprint test. There was no significant correlation between the parameters of isokinetic evaluation and the vertical jump test, showing that the isokinetic test, as well as the 1 RM test although might be useful to measure force in basketball athletes are unable to predict performance in typical activities of the sport such as jumps and high speed motions. This knowledge provides important tools for training planning related to physical capacity strength, showing that muscle force at a specific activity must be trained through particular movements of that activity in order to achieve adequate performance improvements.

Key words: Basketball. Strength. Speed.

Effects of whole body vibration training on explosive strength and postural control in athletes

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Figure 1. Allueva P, *et al.* Normobaric Hypoxic Test

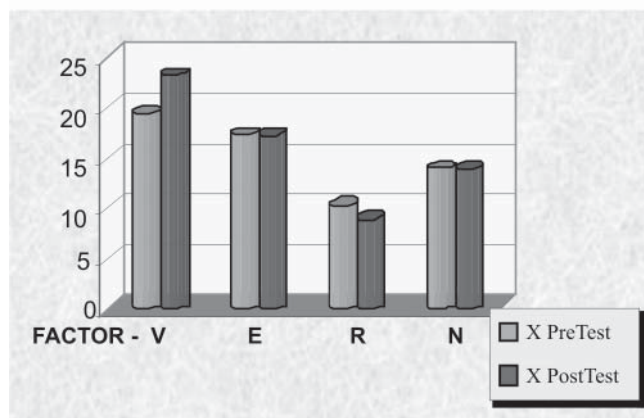


Figure 2. Allueva P, *et al.* PMA Test in the experimental group

POSTER COMMUNICATIONS

Introduction: In the last times vibration training has been used as a new alternative in sport performance. In spite of it, its long terms effects are even little known. The mean objective of this study is to evaluate the efficacy of a 15 weeks whole body vibration training program to improve lower limbs postural control and explosive strength.

Design: Randomized controlled trial.

Participants: 23 basketball women players of competitive level (14-18 years old).

Main Outcome measures: The experimental group underwent a program training in a vibration platform during 15 weeks, with a progression of static and dynamic exercises, three times a week (vibration frequency 25-35Hz and 4mm of amplitude). It has been evaluated explosive strength by means of a countermovement jump, static balance by means of one single leg test with open and close eyes (stabilometry) and dynamic balance through one single leg hop test. All of them showed good to excellent reproducibility.

Results: Vibration group increased significantly the result of the countermovement jump and one single leg hop test ($p=0,00$) at 8 and 15 weeks of training compare to initial test. Control group didn't experimented any changes. There were no significant differences between 8 and 15 weeks. One single balance test with open eyes didn't show significant changes in any group. One single balance test with closed eyes only showed significant differences in vibration group, at 8 and 15 weeks of training compare to initial test ($p<0,05$). There were no significant differences between 8 and 15 weeks of training.

Conclusions: Whole body vibration training increases explosive strength and postural control in young athletes. The more significant increase has been registered at 8 weeks of training.

Key words: Whole body vibration. Postural control. Explosive strength.

Acute effects of static and dynamic stretching on quadriceps and hamstring isokinetic strength in athletes

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Introduction: It was shown that pre-exercise static stretching may temporarily compromise a muscle's ability to produce strength. On the other hand, some evidence exists indicating that dynamic stretching exercises may improve muscle strength performance. The aim was to explore the effects of static and dynamic stretching of the knee flexors and extensors on concentric and eccentric peak torque and electromyography (EMG) amplitude of the knee extensors and flexors in women athletes.

Methods: Ten elite women athletes completed the following intervention protocol in a randomized order on separate days: (a) nonstretching (control), (b) static stretching, and (c) dynamic stretching. Stretched muscles were the quadriceps and hamstring muscles. Before and after the stretching or control intervention, concentric and eccentric isokinetic peak torque and EMG activity of the knee extensors and flexors were measured at 60°/sec and 180°/sec.

Results: Concentric and eccentric quadriceps and hamstring muscle strength at both test speeds displayed a significant decrease following static stretching ($p<0,01$). On the contrary, a significant increase was observed after dynamic stretching for these strength parameters ($p<0,01$). In parallel to this, normalized EMG amplitude parameters exhibited significant decreases following static ($p<0,01-0,05$) and significant increases following dynamic stretching ($p<0,01-0,05$) during quadriceps and hamstring contractions at both concentric and eccentric testing modes.

Conclusions: Our findings suggest that dynamic stretching, as opposed to static or no stretching may be an effective technique for enhancing muscle performance during the pre-competition warm-up routine in elite women athletes.

Key words: Static and dynamic stretching. Eccentric isokinetic torque. Concentric isokinetic torque. EMG activity. Elite women athletes.

Acute effects of dynamic stretching on functional hamstring/quadriceps strength ratio

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Introduction: Although recent studies have shown that dynamic stretching may improve individual muscle strength performance, its effects on the functional H/Q strength ratio and thus on injury risk characteristics has not been investigated in depth. The aim of this study was to assess the effects of dynamic stretching on functional H/Q strength ratios for isokinetic knee extension and flexion at peak and end range moments in elite women athletes.

Methods: A total of twelve healthy elite competitive female athletes (mean age 20 ± 2 years, mean height 166 ± 6 cm, mean weight 58 ± 7 kg) volunteered to participate in the study. All subjects completed a non-stretching (control) or a dynamic stretching intervention protocol in a randomized fashion on separate days. The quadriceps and hamstring muscles were stretched during these protocols. Before (pre) and after (post) the intervention, the functional H/Q strength ratio was calculated at 60°/s-1 and 180°/s-1 angular velocities.

Results: The strength ratio for knee extension displayed a significant increase and for knee flexion a significant decrease following dynamic stretching during the entire and end range of motion at slower and higher angular velocities ($p<0,05$).

Conclusions: The effects of dynamic stretching on functional H/Q strength ratios suggest that the functional H/Q ratio do change positively following a dynamic stretching routine. Athletes that choose to stretch their muscles dynamically will therefore decrease proposed injury risk characteristics.

Key words: Dynamic stretching. Functional H/Q ratio. Elite women athletes.

TRAINING AND PERFORMANCE IMPROVEMENT-II

Heart rate variability and psychological correlate as overload indicators in the Spanish field hockey national team

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Several studies assessing heart rate variability (HRV) during training and competitive season have shown that long and short-term exercise training cause shift from vagal tone to sympathetic activation of autonomic nervous system. To our knowledge, no study to date has investigated the association between HRV and psychological factors and their responses to over load state of elite athletes. In these sense, to diagnose overreaching and to avoid overtraining it is necessary to know both physical and psychological symptoms in athletes. During a preparatory period for Beijing Olympic Games, time and frequency domain heart rate variability with Omega Wave System device and precompetitive anxiety, mood state and subjective fatigue with CSAI_2, POMS and fatigue psychological questionnaires were determinates on the hockey Spanish national team (age $25,76 \pm 3,40$). Data were collected in a room at ambient temperature (22°C to 24°C) between 7:00 AM and 8:30 AM, in two separate sessions: (1) 70 days before of the Olympic games after a short recovery period (2) 40 days before to the Olympic games, one day after a strenuous training. Results showed negative correlation between somatic anxiety and RMSSD ($r = -.536$; $p = 0,026$), pNN50 ($r = -.598$; $p = 0,011$) and HFms² ($r = -.653$; $p = 0,004$); between fatigue perception and RMSSD ($r = -.634$; $p = 0,006$), HFms² ($r = -.625$; $p = 0,007$). Changes from the first to the second session showed that pNN50 (Wilcoxon test; $p = 0,026$) and RMSSD ($p = 0,017$) and SDNN ($p = 0,017$) decreased after a strenuous training while fatigue perception increased ($p = 0,024$). In conclusion, these data suggest that there is a negative association between HRV parasympathetic indexes and fatigue perception and somatic anxiety. Low vagal-related indexes of HRV and the incrementation of fatigue perception due to over load state of athletes, can be useful to adjust the intensity of training.

Key words: Heart rate variability analysis. Overreaching. Psychological evaluation.

Muscle fiber composition and neuromuscular and metabolic responses during high-intensity strength exercise

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The purpose of this investigation was to relate muscle fiber composition to the neuromuscular (muscle power output and electromyography activity) and metabolic (blood lactate and ammonia concentration) responses during a high intensity leg press exercise (5 sets of 10RM). Twelve physically active males were biopsied from the vastus lateralis muscle to determine their percent distribution of type I, type IIa and type IIx muscle fibers as identified through myofibrillar adenosine triphosphatase activity. Two subject groups were selected on the basis of a high ($73,5 \pm 8,5$ % type I fibers; HST group) or low ($50,3 \pm 7,7$ % type I fibers; LST group) percentage of slow-twitch fibers. A bilateral leg extension exercise machine was instrumented with several strain gauges and an optical encoder to obtain accurate measurement of mechanical power output during the concentric phase of the leg extension. Surface electromyography (EMG) of the m. vastus lateralis and vastus medialis (median frequency) was also measured. In addition, the subjects performed a graded cycle ergometer exercise to estimate the maximal oxygen uptake (VO_{2max}).

No significant differences were found between the groups in 1RM load ($178,7 \pm 37,2$ and $200,5 \pm 14,7$ Kg) and 10RM load ($148,2 \pm 4$ and $166,7 \pm 14,1$ Kg) and estimated VO_{2max} ($58,2 \pm 3,9$ and $57,5 \pm 6,3$ ml·kg⁻¹·min⁻¹), for HST and LST, respectively. In the first bout of the exercise, no significant differences were found in the peak power output between the groups (708 ± 263 and 862 ± 182 W, for HST and LST respectively). However, at the end of the fifth bout of the exercise, peak power output in LST decreased ($P < 0.05$) by $33,7 \pm 21,1$ %, whereas no significant changes were observed in HST. The peak blood ammonia ($120,3 \pm 30,3$ μM, LST and $58,8 \pm 25,9$ μM, HST) and lactate ($11,4 \pm 2,5$ mM, LST and $8,7 \pm 1,9$ mM, HST) were significantly higher ($P < 0.05$) in LST than in HST. The individual decrease in peak power output (expressed in percent of initial values) correlated positively with % IIx fibers ($R^2=0.58$; $P < 0.05$) as well as the individual initial peak power output values ($R^2=0.71$; $P < 0.05$), correlated negatively with the estimated VO_{2max} of the subjects ($R^2=0.61$; $P < 0.01$). A significant relationship was observed between the individual values of blood ammonia and the individual values of % II fibers ($P < 0.01$; $R^2=0.67$). The EMG median frequency decreased significantly ($P < 0.05$) in the LST but, did not change in HST group.

The results of this study show that the subjects with higher % of IIx fibers present higher peak blood ammonia and lactate values, as well as higher decrease in peak power output during the leg press exercise. The higher decrease in the EMG median frequency observed in LST could reflect a selective fatigue of type II fibers. The correlations observed in this study suggest that in this population muscle fiber composition can be indirectly and non-invasively estimated from muscle power output decrease and the peak blood ammonia concentration.

Proyecto financiado en parte por el Plan Nacional I+D+I 2004-2007 (DEP2006-56076).

Key words: Fiber composition. Muscle power. Fatigue.

Body temperature and motor fitness in Japanese school children

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Background: Recently, the long-term decline in the motor fitness of Japanese school children is demonstrated statistically. The necessity of this improvement is under discussion in the field of education and sports medicine. Body temperature is thought to be one of the factors related the motor fitness. The purpose of this study is to evaluate the body temperature and motor fitness in Japanese elementary children.

Methods: Seventy-four Japanese children in an elementary school (Aged 10-12: 49 males, 25 females) participated in this study and performed 8 fitness test widely used in Japan (grip strength, sit up, sit & reach, side step, shuttle run, 50m dash, standing long jump, softball throw). Body temperature in the early morning was measured at home. Participants are divided into two groups according to body temperature; below 36 deg C (group Low) and over 36 deg C (group High). Statistical analysis of the data was performed by using t test.

Results: Values of softball throw in group High were significantly higher than those in group Low ($p < 0.05$). Values of standing long jump in group High were significantly higher than those in group Low among female children ($p < 0.05$).

Discussion: Our study suggested that body temperature was related to motor fitness of students. Although further studies will be needed, body temperature may be a significant factor to estimate a level of motor fitness in school children.

Key words: Body temperature. Motor fitness.

Effect of sport expertise on attentional performance during moderate aerobic cycling

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Introduction: Systematic sport practice along time leads to general and specific adaptations in practitioners. Traditionally, sport sciences have studied the effect of sport expertise on individual changes as coordination and techniques, muscular functions (strength or endurance), cardiovascular performance... However, only recently have started researchers to study how sport practice influences cognitive functioning. One of the most important principles of sport adaptation argues that this is specific from type and nature of practice. According to this principle, it was hypothesized that differences in attentional performance would be found between expert cyclist and no cyclist students.

Method: Participants completed a task designed to measure attentional performance of each attentional function (alertness, spatial orienting and executive control) (ANTI, Callejas, Lupiáñez & Tudela, 2004) at rest and cycling at moderate aerobic exercise conditions. A repeated measured ANOVA was used to analyze median reaction time (RT).

Results: Data replicated the typical pattern of attentional networks principal effects and their interactions. More importantly, participants were faster in the exercise condition than at rest, although the effect of exercise was lower at cyclist (faster at rest than students). Moreover, moderate aerobic exercise reduced attentional cost, thus improving performance of the orienting network, and reduced the size of the alertness effect, both independently of group of participants. However, the orienting effect was bigger in cyclists than in students. Furthermore, cyclists showed less interference than students, when no orienting cue was presented. So, cyclists showed a better functioning of the orienting and executive control networks than students.

Discussion: The pattern of results indicates that the effects of exercise are independent of the level of skill of participants, suggesting that it could be related to general arousal activation and/ or the bigger motivation and challenge experience at effort than rest condition. However, the more efficient performance of orienting and control executive attentional networks at cyclist could be linked to the relationship between physical fitness and cognitive performance or/and more competitiveness typical profile of sport practitioners.

Key words: Attention. Exercise. Specific skill.

Linear vs nonlinear periodized plyometric training programs in amateur squash players

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Introduction: Plyometric training consists of a rapid stretching immediately followed by a concentric action of a muscle. The rapid eccentric phase of muscle contraction stimulates the muscle spindle and the elastic properties of the muscle, facilitating the concentric contraction. Plyometric training has been shown to be an effective method for the improvement of both vertical jump and sprint performance. To date, no studies have researched the effect of plyometric training using different periodization strategies. Therefore, the aim of this study was to compare the effect on vertical jump and sprint performance between linear and nonlinear periodized plyometric training in amateur squash players.

Methods: Twenty-one amateur squash players took part in the study. The subjects were randomly assigned to 1 of the following 3 training groups: control (C), linear periodization (LP) and daily undulating periodization (UP). Assessments for speed (20 m sprint time), vertical jump height (squat jump (SJ) and counter-movement jump (CMJ)) were performed before and after 6 weeks of plyometric training, performed 3 day per week.

Results: No significant differences were found between training groups for the 20 m sprint time and no time interaction was found. No statistical differences were observed between groups in SJ and CMJ. Both, SJ and CMJ height values changed significantly in LP and UP. SJ values increased from pre-test to post-test by 2.2 cm (8.4 %) and 3.3 cm (13.1 %) in LP and UP, respectively. CMJ values showed an increase of 3.7 cm (10.5 %) in LP and 3.5 cm (10.4 %) in UP.

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Conclusions: These data indicate that 6 weeks of periodized plyometric training enhanced SJ and CMJ performance in amateur squash players. Both, LP and UP periodization models were effective in early phase training. Future studies should evaluate the effect of these models with extended training duration, as well as with well trained squash players.

Key words: Plyometric training. Linear and nonlinear periodization.

TRAINING AND PERFORMANCE IMPROVEMENT-III

Basal salivary cortisol levels in elite athletes: is there any variation depending on sport discipline?

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Cortisol is a corticosteroid hormone produced in the Zona fasciculata of the adrenal gland cortex. It is involved in the response to stress. Cortisol levels undergo diurnal variation, with the highest level present in the early morning, and the lowest around midnight, 3-5 hours after sleep onset.

Given sport as a major stressor in elite athletes life, it seems sensible to study cortisol levels in such a population.

Aim of this study was the assessment of possible differences in basal salivary cortisol levels between male and female elite athletes and, within these samples, differences depending on the specific sport discipline practiced.

This study covers a two years period (2006-2007). Its sample size refers to the number of cortisol samples and not to the number of athletes involved, which means the same subject may have given more than one sample.

806 salivary samples were collected in Salivette test tubes among Olympic teams of different disciplines. These samples were frozen and stored at -70°C until testing. A fully automated chemiluminescence system (Salivary Cortisol ELISA kit, DRG Diagnostics, Germany) was used to analyze the samples.

Data obtained were evaluated both through parametric (t Test) and non parametric statistics (Wilcoxon Test), depending on data distribution. Results are presented as mean \pm standard deviation; differences were considered significant at $P < 0.01$.

A statistical significant difference was evident in the comparison between male (n.627 samples) and female (n.179 samples) population (8.0 ± 3.6 vs 8.7 ± 3.1 ng/ml respectively, $p < 0.01$). Within the male and female populations further comparisons were led between each sport discipline. Statistical significances are presented in the Table 1.

Table 1. Mauri C, et al.

Discipline	Category	n.	Male	n.	Female
Cycling and running	Long term Endurance	36	5.9 ± 2.9 *		
Triathlon	Long term Endurance			31	6.8 ± 2.4 #
Rowing	Middle term endurance	471	8.0 ± 3.5	94	8.5 ± 3.2 #
Soccer	Team sport	121	8.9 ± 5.0		
Throwing disciplines	Resistance			54	10.2 ± 2.6 #

* $p < 0.01$ statistically significant differences only between long term endurance and, respectively, middle term endurance and team sport; # $p < 0.01$ all the comparisons led within this population showed statistically significant differences

There are no apparent clinical or physiological reasons supporting the statistically significant difference found between the whole male and female populations. It might come from the two populations different sample size.

As far as the male group is concerned the Endurance sample always shows significantly lower values than the other two groups, this could be considered as an expression of different adaptive responses to a training with volume prevailing over intensity. In the female group statistically significant differences were found in all the comparisons. The more intensity overcomes volume in the training, the higher the basal cortisol levels become.

Given the data in this study it is possible to suggest that basal cortisol levels follow a direct adaptation to the workload intensity.

Key words: Salivary cortisol. Elite athletes. Training.

Validity of force generation and speed movement during bench press in male wrestlers: practical applications

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The ability to develop explosive movements with heavy and light loads is crucial in Olympic Wrestling disciplines. In order to analyze these manifestations of upper body strength in wrestlers and to determine the functional profile adjusted to the demands of high competition, we examine the force-velocity relationship (F-V) as a fundamental part of the control and planning of the training in wrestlers. Sixteen Olympic trained wrestlers participated in this study. The protocol consisted of a bench press test (concentric phase) of increasing loads (F-V curve), analyzing power (P), force (F), and velocity (V), with an electronic dynamometer (Real power Pro of Globus), at different loads and the variables related to the maximum power (MP). The evaluation was done at the beginning of the special preparation phase. Results showed a power curve with a marked zone at the top. The MP observed were of 6.71 ± 1.14 W/Kg, and they were obtained at speed of 1.06 ± 0.12 m/s and at $44.21 \pm 6.75\%$ of RM. The maximum strength values (Fmax) were of 1.06 ± 0.22 Kg/Kg of mc. All of these results showed deficiencies with respect to other wrestling disciplines (10.06 ± 3.17 W/kg of PM vs 1.41 ± 0.49 m/s of V and 1.28 ± 0.16 Kg/Kg of mc of RM). We can conclude that the F-V curve analyzed is a valid procedure in planning and control of strength training. The results display a medium-low MP level in the study group at a low load. Two further strength training objectives remain for these subjects: an increase in optimal Fmax values and the improvement of the MP in heavy loads.

Key words: Olympic wrestling. Power. Maximal strength. Strength training.

Sprint capacity differences in soccer players with distinct sprint performances

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Introduction: Sprint capacity of soccer players is an important variable in modern soccer and could be crucial in critical duels which might influence the results of a game. The aim of this study was to compare the sprint capacity of professional soccer players with different sprint performances.

Materials and methods: 143 professional soccer players of the 1st Brazilian Regional Division (age: 23.91 ± 3.95 y; height: 177 ± 0.06 cm; body weight: 73.28 ± 6.56 kg) performed the 30m linear sprint test and were timed by photocells positioned at starting line (0m) and at 10, 20 and 30m of distance. For data analysis, the players were divided in quartiles according to their performance (final time) on 30m sprint test and they were classified into: Q1 ≤ 4.06 s, n=38; Q2 ≤ 4.15 s, n=37; Q3 ≤ 4.24 s, n=31; Q4 ≤ 4.72 s, n=37. In order to compare the average time among the groups in the different distances, the ANOVA (one-way) was used and the Tukey's post-hoc test was utilized to determine pair wise differences ($p < 0.05$).

Results: All groups were significantly different from each other in all the distances (Table 1). The Table 2 shows the average distances when comparing the athletes of the Q1 to the athletes of Q2, Q3 and Q4 athletes.

Table 1. Aguiló A, et al. Sprint time (s) by groups in different distances (Mean \pm SD).

Groups	10m	20m	30m
Q1*	1.66 ± 0.04	2.86 ± 0.05	3.98 ± 0.05
Q2*	1.73 ± 0.05	2.96 ± 0.04	4.11 ± 0.02
Q3*	1.78 ± 0.05	3.04 ± 0.04	4.20 ± 0.02
Q4*	1.86 ± 0.08	3.16 ± 0.10	4.36 ± 0.10

* $p < 0.001$ compared to all other groups.

Table 2. Aguiló A, et al. Mean distances (m) of the athletes of the Q1 compared to the athletes of the other groups.

Groups	10m	20m	30m
Q2	0.39	0.65	0.95
Q3	0.71	1.18	1.56
Q4	1.10	1.87	2.57

Conclusions: The fastest players at the 30m sprinting test showed the fastest as well in all other distances and this may be advantage when performing short distances during the game.

Key words: Soccer. Sprint test. Sports performance.

Control of the tennis stroke and metabolic responses through a new specific tennis field test

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The endurance and success of stroke are some of the key point factors of tennis performance. There is a lack of specific field tennis tests to prescribe and control training performance; therefore it is necessary to investigate on new field test that allows relating the physiological parameters to the technical.

Aim: The aim of this preliminary study was to apply a new specific tennis field test to know the relationship between the workload in metabolic zones and success or efficiency of stroke (ES) and determine a model of response.

Methods: The study was realized by 5 tennis players (age $23 \pm 1,9$ years; height 174.9 ± 5.7 cm; weight 68.1 ± 5.7 kg; training per week 8.2 ± 2 hours). All subjects performed two incremental protocols to exhaustion: laboratory test (treadmill test) and a tennis specific field test. The field test consisted of repeated strokes (forehand and backhand) during 1 min, with 20 sec of rest. In both tests, heart rate (HR) and rating of perceived exertion (RPE) was monitored; the ventilatory thresholds were determined in the laboratory test.

Results: The relationship between the metabolic zones by workload and ES was kept constant ($> 60\%$ ES) up to work near anaerobic threshold, where it started to decrease ($> 10\%$ ES per workload).

We have obtained three different types of response: a) Type 1: better ES in mixed zone, b) Type 2: better ES in aerobic zone, c) Type 3: ES stable in the 3 zones.

Conclusion: The new specific tennis field test is a practical tool that allows an objective control of the training performance. The efficiency of stroke is better in aerobic zone (before VT1), maintain a regular response in mixed zone (between VT1-VT2) and decrease near anaerobic threshold (VT2).

We find three types of response: Type 1 mixed, Type 2 aerobic and Type 3 stable.

Key words: Field test. Tennis performance. Success of stroke.

Balance and postural control assess in elite ice skaters

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Regarding biomechanics, ice skating requires dynamic and static postural control of neuromuscular balance and coordination features as well as skills which are far more important than those essential for other sports or every day life activities. Especially within elite ice skating, mainly in technical gestures such as “take off” and “landing” of jumps.

The Neurocom Balance Master device provides basic technology to assess such features.

Objectives:

- Determine whether Neurocom Balance Master allows to assess and discriminate balance, coordination and postural control skills within ice skating.
- Determine which parameters are more suitable and discriminative to assess ice skaters' balance and coordination.
- Obtain data to increase the normative database within Spanish elite sportsmen and provide knowledge to improve training systems and performance.

Materials and methods:

Subjects: 45 healthy elite ice skaters, 20 men and 20 women (age range, 12 – 17 years).

Control Group: 60 students (who didn't practice any sport, age range, 15 – 20 years)

Instruments: Neurocom Balance Master Posturographer.

Protocol: 1. Specific warm up; 2. Three repetitions of each of the following tests (Table 1); 3. Description of variables. The “t of Student” was used to analyse independent samples. (Statistics pack SPSS. 15.00)

Results and conclusions:

1. Posturography assess using Neurocom Balance Master allows a suitable discrimination of balance and coordination features in elite ice skaters.
2. The most discriminative parameter was the sway of Centre of Gravity (COG)'s shift in the test CTSIB (modified), when the sportman is on a foam surface with closed eyes.
3. Several parameters show a significant difference if compared to the control group.
4. Men data regarding RWS test were higher than such data in women, showing a better velocity of reaction.

Data will be shown within graphs and tables.

In this trial, the results belong to data obtained along the development of the project: “ViiP: Intelligent System for Isokinetic and Posturographical Analysis, Integration and Assess of the Spine” Financed by the Ministry of Science and Innovation. Research Head Office Science and Technology I + D. Projects: africa.lopez@csd.mec.es

Key words: Balance master. Posturography. Skating. Balance. Medicine. Biomechanic. Sport.

TRAINING AND PERFORMANCE IMPROVEMENT-IV

Assess of isokinetic trunk strength in elite basketball players

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Table 1. López-Illescas A, et al.

TESTS	PARAMETERS				
Clinical Test of Sensory Interaction on Balance (modified CTSIB)	Mean Center of Gravity Sway Velocity				
Limits of Stability (LOS)	Reaction Time	Movement Velocity	Endpoint excursion	Maximum Excursion	Directional Control
Rhythmic Weight Shift	On-Axis Velocity	Directional Control			
Step/Quick Turn	Mean Turn Time	Mean Turn Sway			
Step Up/Over	Mean Lift-Up Index	Mean Movement Time	Mean Impact Index		
Forward Lunge	Mean Distance	Mean Impact Index	Mean Contact Time	Mean Force Impulse	

POSTER COMMUNICATIONS

Basketball is a sport discipline which requires strength, speed and endurance. Players' huge size and weight determine a high level of trunk muscle strength. The assess of trunk strength and of the abdominal strength/ back strength ratio are main elements when analysing the efficiency of training, as well as its probable impairments.

Objectives:

- Find out which tests and parameters are the most suitable and discriminative to assess isokinetic trunk strength in basketball players.
- State reference values regarding isokinetic strength in elite basketball players.
- Establish elements to improve training and performance qualities.

Materials and methods:

Subjects: 32 healthy basketball players (age range, 18 – 28 years)

Control group: 60 non sport practising students (age range, 18 – 26 years)

Instruments and protocol: System ISOKINETIC BIODEX SYSTEM3 Dual position Back Ex/ Flex.

The following protocol was followed:

- Clinical evaluation of the spinal column.
- Teleradiology (Anteroposterior and Lateral) of the spine
- Isokinetic trunk tests: Each test was performed in two different positions: Semi-Standing (Functional) and Seated Compressed (Analytical).
 - 1st test: Flexion / Extension. ROM 90°, velocity 60°/s (10 repetitions).
 - 2nd test: Flexion / Extension. ROM 90°, velocity 90°/s (10 repetitions).
 - 3rd test: Flexion / Extension. ROM 90°, velocity 120°/s (20 repetitions).

Analysed data: Morphology of the curve, Maximum Peak Torque (N*m), Total Work (Joules), agonistic/antagonistic ratio, and Angle distribution of peak torques along the Range of Movement.

Results:

- Basketball players showed higher values of Maximum Peak Torque and Total Work than those found within the control group.
- Basketball players results didn't show significative differences regarding agonistic / antagonist ratio, when compared with data found within the control group.
- Angle of maximum peak torque values were not conclusive, for great data dispersion appeared within data analysis.
- The most discriminative parameter was Total Work

The numerical values will be shown within tables and graphs.

Conclusions:

- Isokinetic testing is a valid and reliable method to assess trunk strength in elite basketball players.
- The study of muscular balance regarding agonistic / antagonist ratio over healthy basketball players has shown useful to improve the sport gesture technique within play, therefore stabilising the position of the back.
- Further study is essential for a suitable evaluation of the morphology of the isokinetic curve.

In this trial, the results belong to data obtained along the development of the project: "ViIP: Intelligent System for Isokinetic and Posturographical Analysing, Integration and Assess of the Spine", financed by the Ministry of Science and Innovation. Research Head Office Science and Technology I + D.

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Key words: Basketball. Isokinetics. Strength. Back. Trunk. Biomechanics. Medicine.

Heart rate variations of Venezuelan elite judoists during a training season at middle altitude conditions

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Introduction: Acclimatisation to environmental hypoxia causes adaptations that raise oxygen transport and utilisation. The purpose of this research was to determine the effects of middle altitude training on the cardiovascular system among well-trained judoists. A descriptive study was made during a training period of Judo Venezuelan selection at 2330 of altitude meters.

Material and methods: The sample was integrated by 14 judoists that were getting ready to attend the Beijing Olympic Games. Variations of baseline heart rate (HR) were recorded at supine decubitus and orthostatic position, as well as before and after the loads of tactical-technical training. Using the equation of Karvonen, percent of recovery values were determined and characteristics of changes studied during 25 days. Descriptive statistics are used, the comparisons

among sexes were made with the Student T and one way variance analysis established differences among weeks. The obtained results are shown in charts and graphics.

Results: Significant differences were observed among sexes for basal HR, the one taken in orthostatic position, baseline HR of fifth day, as well as percent of recovery at second minute.

Conclusion: Three weeks of altitude training may give a benefit for elite competitive judoists even though may induce some physiological adaptations on cardiovascular system.

Key words: Judoists. Heart rate. Orthostatic test.

The analysis of abdominal muscle activity during trunk curl up exercise based on Pilates Method

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Introduction: In recent years, Pilates has become a popular trend in rehabilitation and fitness. Pilates exercise focuses on abdominal musculature, in particular transversus abdominis and internal oblique, which are useful to stabilize the lumbar spine. However, no study to analyze the patterns of abdominal muscles activation during exercise based on the Pilates method.

The purpose of this study was to analyze the pattern of abdominal muscles recruitment during trunk curl up exercise based on Pilates method using electromyography.

Methods: Nineteen healthy subjects without low back pain were participated in this study. All subjects performed trunk curl up exercise based on the normal method and the Pilates method, and double leg raise in spine. Surface electromyographic data were collected from rectus abdominis (RA) and internal oblique abdominis (IO) during trunk curl up exercise based on the normal method and the Pilates method, and double leg raise. The Data of both trunk curl exercise were normalized using the double leg raise data. The ratio of activation of the IO relative to RA was calculated (IO/RA).

Results and conclusions: In RA activity, there were no statistically significant differences between the normal method and the Pilates method. In IO activity, the Pilates method showed a significantly greater level of activation compared with the normal method. Moreover, in IO/RA, Pilates method showed a significantly greater level compared with the normal method.

These results suggested that trunk curl up exercise based on the Pilates method was more effective to contract IO than that based on the normal method. IO is known as inner unit and it is useful to stabilize the lumbar spine. It is concluded that Pilates method may be effective to educate and strengthen inner unit of abdominals and to stabilize the lumbar spine.

Key words: Pilates. Abdominal muscle. Electromyography.

Spatial and temporal perception in swimmers and sedentary children

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It is commonly accepted that the involvement in sports activities leads to a development of both conditional and coordinative capacities. As swimming involves propulsion in a non habitual three-dimensional environment, spatial and temporal perception seems to be essential capacities to develop since young ages.

The aim of this study was to investigate space and time perception in swimmers and sedentary. Two groups (9 - 11 years old) composed by swimmers (10 girls and 9 boys) and sedentary (10 girls and 10 boys) were analyzed. It was applied the Instrument of Linear Positioning which assesses, separately, the spatial perception, the temporal perception and spatial and temporal perception combined. Tests were performed with the preferred hand, assessed by the Dutch Handedness Questionnaire (Van Strein, 2002). Statistical procedures included descriptive statistics (mean and standard deviation) and inferential statistics (Mann-Whitney test). Alpha was set at 0,05.

As expected, swimmers, as a group (Table 1) and by sex, presented higher temporal perception than sedentary. However, in the spatial perception, as well as in the combination between temporal and spatial perception (expressed in distance

Table 1. Fernandes R, *et al.* Mean ± SD value obtained in the swimmers and sedentary groups

	sedentaries	swimmers	T	p
Spatial perception (cm)	4,26±2,87	3,2±1,84	1,37	0,179
Temporal perception (s)	1,18±0,63	0,61±0,34	3,50	0,002
Spatial (combination temporal perception) (cm)	7,27±4,58	5,51±3,59	1,33	0,191
Temporal (combination spatial perception) (s)	1,42±1,31	1,01±0,54	1,27	0,25

Table 2. Fernandes R, *et al.* Mean ± SD value obtained in the male and female groups

	Male (sedentaries + swimmers)	Female (sedentaries +swimmers)	T	p
Spatial perception (cm)	4,00±2,97	3,50±1,89	-0,63	0,532
Temporal perception (s)	0,85±0,65	0,96±0,52	0,61	0,544
Spatial(combination temporal perception) (cm)	6,25±4,70	6,57±3,71	0,24	0,811
Temporal (combination spatial perception) (s)	1,17±0,77	1,26±1,23	0,30	0,712

and time), the differences were not significant.

In each group (swimmers and sedentary), sex did not present a significant effect (Table 2), which is according with the literature (Malina, *et al.*, 2004).

This fact occurs namely due to the fact that at this ages the differences in the development patterns are minimum, which leads to the observation of no differences between performances in sports.

References:

- Malina M, *et al.* Growth, Maturation, and Physical Activity. Leeds: Human Kinetics 2004.
- Van Strein JW. The Dutch Handedness questionnaire. Rotterdam 2002.

Key words: Biomechanics. Strength. Velocity.

Arm coordination and intracyclic velocity variations during a time limit test at the velocity of VO₂max

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In swimming, the index of coordination (IdC), initially proposed by Chollet, *et al.* (2000), measures the lag time between the end of the propulsive phase of one arm and the beginning of the propulsive phase of the opposite arm. Since then, few studies have been conducted using protocols with an imposed constant pace until exhaustion. The purpose of the present study was to assess the modifications of arm coordination during a Time Limit test (to exhaustion) at the minimum velocity of VO₂max (TLim-vVO₂max). Additionally, knowing that the magni-

tude of the intracyclic velocity variations has been considered as an indicator of swimming efficiency, it was studied the relationship between this parameter and the IdC during the TLim-vVO₂max test.

Three high level male swimmers were studied (181±12cm, 75±11kg and a VO₂max of 74±4 ml.kg⁻¹.min⁻¹). The vVO₂max was determined through an intermittent incremental protocol and, 48h later, the TLim-vVO₂max test was conducted according with Fernandes, *et al.* (2003). Velocity was always controlled using a visual pacer and VO₂ was measured through direct oximetry (K4 b², Cosmed, Italy) using a respiratory snorkel and valve system. Video analysis was used in order to assess the IdC to evaluate the arm coordination (Chollet, *et al.*, 2000). The APAS software (Ariel Dynamics Inc, USA) was used to assess the horizontal intracyclic velocity variations of the centre of mass: 4 complete cycles were analyzed (one in the first, another in the last 50m, and two in the intermediate 100m) of the TLim-vVO₂max test. Mean (SD) and Spearman correlation coefficient were used (p<0.05).

As it is possible to observe in Figure 1, the IdC reveals some stability during the TLim-vVO₂max test in the swimmers 1 and 2 and seems to change in swimmer 3, being in accordance with the data obtained by Alberty, *et al.* (2008). Furthermore, the IdC during TLim-vVO₂max seems to be inversely related with the intracyclic velocity variations of the CM (-0.99, -0.78, -0.78 and -0.64 for subjects #1, 2, 3 and total sample, respectively). These results seem to express that the swimmers, to be able to maintain the vVO₂max, adapt their arm coordination. These adaptations, and the lower values of intracyclic velocity variations, seem to be a strategy to deal with the appearance of fatigue in the last moments of the time to exhaustion test. The IdC seem to reflect the effects of exercise to exhaustion on swimming tech-

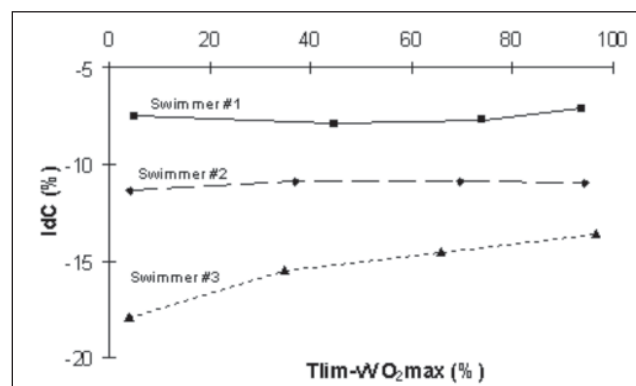


Figure 1. Morais P, *et al.* Evolution of IdC in the TLim-vVo2max test

nique, being a useful tool for coaches and scientists in order to better understand the technique modifications under fatigue conditions. As suggested before (Figueiredo, *et al.*, 2008), changes on arm coordination, linked to muscular endurance limitations, appear to be a compensatory mechanism used by swimmers, trying to find the most efficient arm coordination for a particular context.

References:

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- Fernandes, *et al.* Int J Sports Med 2003;24(8):576-81.
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