

ORAL COMMUNICATIONS

ATHLETE'S CARE-I

LANGUAGE: ENGLISH

A portable device for assessing locomotor performance

L'Hermette M^{1,2}, Savatier X^{2,3}, Tourny-Chollet C^{1,2}, Dujardin F²

¹CETAPS, EA 3832, University of Rouen, Rouen, France. ²GRHAL, University of Rouen, Rouen, France. ³Automatique Industrielle, ESIGELEC, Rouen, France

We investigated the validity of a new portable system and the feasibility of the method for gait analysis as the assessment of gait has clinical relevance in the study of locomotor pathologies.

This system is composed of a data logger, triaxial accelerometers, and software. Measurements of the pelvis kinematics during gait were performed on five hip osteoarthritic subjects and 15 healthy subjects using the portable system and a reference system (ViconTM). The healthy subjects were studied in conditions of normal gait and gait altered by a heelpiece. The studied variables were the vertical amplitude of the sacrum, the time of gait cycle and the vertical trajectories of the spines. The new system corresponded with the reference system for the studied variables. The small differences between the two systems in the vertical amplitude of the sacrum (0.53 ± 6.39 mm), time of the gait cycle (0.002 ± 0.05 s), and the vertical trajectories of the spine (coefficient correlation of 0.06 ± 0.05) confirmed the validity of the portable system data. The results showed a distortion of the pelvis trajectory when the gait was impaired. The portable system provides an objective method to discriminate normal from limping gait and is easy to use outside of the laboratory.

This system can be used in outpatient settings as it presents a great autonomy and simplicity to function. The objective evaluation of the quality of gait may improve the capacity to analyze the effects of rehabilitation protocols or training programs.

Key words: Locomotor performance. Ambulatory system. Triaxial accelerometer.

Neuropsychological testing in boxing

Bianco M^{1,2}, Fabiano C¹, Ferri M¹, Scardigno A¹, Tavella S³, Caccia A³, Manili U³, Faina M^{2,3}, Zeppilli P¹

¹Sports Medicine Department, Catholic University, Rome. Italy;

²Medical Commission, Italian Boxing Federation, Rome. Italy;

³Sports Medicine and Science Institute, National Italian Olympic Committee, Rome. Italy.

Introduction: Boxing is a sport where athletes deliberately throw blows and receive blows to the head and one way to win a competition is causing a concussion (winning by knockout). Years of boxing practice could impair cognitive functions. Aim of this study was to investigate cognitive functions in boxers.

Methods: The study population was composed of male subjects, with no previous history of head concussions (except from boxing): a) 33 boxers at their first medical examination for debuting in amateur boxing, never engaged in competitive boxing nor other ring sports before; b) 27 professional boxers, renewing their license. Subjects were requested: a) to fulfill a questionnaire collecting demographic data, level of education, occupational status, boxing record (for professionals) and number of head concussions during boxing practice; b) to undergo a computerized neuropsychological (NP) test (CogSport).

Results: Professionals were significantly ($p < 0.0001$) older (29.4 ± 4.19 years) and started boxing training at a significantly younger age (14.5 ± 3.94 vs 20.3 ± 4.77 years, $p < 0.0001$) than debutants (24.1 ± 5.13 years).

Debutants showed a significant shorter simple reaction time (RT) than professionals, both at the beginning (2.44 ± 0.070 vs 2.49 ± 0.075 ms, $p = 0.005$) and the end

(2.47 ± 0.069 vs 2.51 ± 0.079 ms, $p = 0.028$) of the NP-test. Complex RTs didn't differ between groups.

For professionals, a positive correlation was found between simple RT at the beginning of the NP-test and the total number of disputed ($r = 0.386$, $p = 0.043$) and won ($r = 0.400$, $p = 0.035$) bouts. A negative correlation ($r = -0.468$, $p = 0.012$) was found between simple RT at the end of the NP-test and the total number of bouts lost due to head blows.

Conclusions: Professional boxers show a longer simple RT in respect to debuting amateur boxers, with no difference regarding more complex cognitive tasks. A possible explanation may be found in a kind of adaptation of skilled boxers to better (and longer) evaluate external stimuli before giving a simple motor response.

Key words: Head concussion. Cognitive impairment. Dementia pugilistica.

Comparison of prevalence symptoms of premenstrual syndrome (PMS) in athletes and non-athletes female students

Moghadasi A¹, Abasi Darebbeedi M², Kargarfard M²

¹University of Payame Noor, ²University of Isfahan

Introduction: The purpose of this study was to compare prevalence symptoms of premenstrual syndrome (PMS) in athletes and non-athletes female students of the Islamic Azad University of Ilam.

Method: Sample of this study comprises 100 athletes female (Mean \pm SD; Age 23.6 ± 4.1 year, height 162.9 ± 5.4 cm, weight 60.7 ± 9.0 kg, previous history of sport activity 3.3 ± 2.8 year) and 100 non-athletes female (Mean \pm SD; Age 22.3 ± 2.2 year, height 162.2 ± 5.6 cm, weight 59.4 ± 8.6 kg) were selected among female students who had regular menstrual cycle and didn't use drug. Instrument of research was PMS questionnaire. To analyse the data descriptive and t-test were utilized.

Results: The results of this study showed that female athlete students had somatic symptoms significantly lower than non-athletes female students ($t = -1.79$, $P = 0.024$). But no significant relation was gained between psychological symptoms of athlete and non-athletes. Also in terms of PMS no significant relation between athlete (21.5 ± 13.1) and non-athletes (27.8 ± 15.9) female students was reported ($t = -2.04$, $P = 0.091$). However, of the total 93.5% (187 n) subjects had PMS that no significant difference between athletes (91%) and non athlete (96%) students ($t = -2.16$, $P = 0.175$) was reported. In athlete students symptoms were lower than non athlete students but this difference was not significant ($t = -2.01$, $P = 0.775$).

Discussion: According to the results of this research, reduction of somatic symptoms in athlete student in regard to non-athlete student and treatment ways should be effective, free-danger, free-side implication, easy and available. Therefore we suggest that females who have PMS have to do some sport training session regularly in a week.

Key word: Premenstrual syndrome. Somatic symptoms. Psychological symptoms. Athletes & non-athletes female.

Characteristics of anaerobic fatigue and isokinetic knee strength between pre and post winter season in Korea alpine ski racers

Hye-Jung Choi¹, Young-Soo Jin², Tae-Won Jun¹, In-Sub Chung³

¹Department of exercise physiology of Seoul National University;

²Department of sports and health medicine center of Asan Medical Center; ³Federation International de ski

Introduction: The purpose of this study was to compare anaerobic fatigue and lower body strength, quadriceps and hamstring between pre-and post winter season (4month, 13competitions) in Korea Alpine ski racers.

ORAL COMMUNICATIONS

Methods: Thirteenth males of Korea alpine ski racers (mean age: 18.8years, mean career:9.48years, mean height:173cm, mean weight: 71.5kg) were examined. Anaerobic fatigue was tested by Wingate during 90second and knee strength examed extension and flexion power. There were tested by cybex 770 Isokinetic dynamometry. The test protocol were 30°/sec, 180°/sec and 240°/sec.

Results: Each test has peak power and the ratio of quadriceps and hamstring power. Anaerobic fatigue was significantly increased after winter season ($p<.05$) from pre season (63.9) to post season (77.4). In isokinetic power, there was a significant difference between pre and post season on both flexion ($p<.05$), extension ($p<.01$) at 30°/sec. Extension power was also reduced at after season in 180°/sec whereas muscle ratio was not significant. Extension power was significantly reduced ($p<.05$), and muscle ratio shown a significantly difference ($p<.05$).

Conclusions: We found that there are significant differences between pre and post season for anaerobic fatigue and the isokinetic knee function. Furthermore, extensor power was more reduced than flexion power through different protocols (30°/sec, 180°/sec and 240°/sec). These data suggest that the quadriceps muscle are more fatigue than hamstring muscle at the end of post winter season in Korea alpine ski racers. Muscle imbalance is strong risk factor of injury and also that influence on race performance because of difficult to get right skill. This data indicates burn down strength during winter season. That means we need more strength training in pre-season.

Key words: Alpine ski. Anaerobic fatigue. Isokinetic knee strength. Pre-post season.

BIOMECHANICS-I

LANGUAGE: SPANISH

Kinanthropometry versus impedance tetrapol in dancers the national dance company

Andrés A, Cabañas MD, Moreno Y.

Department of Human Anatomy and Embryology II de la Facultad de Medicina de la Universidad Complutense de Madrid (UCM)

Introduction: Although the Spanish dancers excel in the international arena, there is a vacuum in terms of scientific studies of the population of professional dancers in our country. In eagerness to fix it, the Complutense University of Madrid began a thorough study whose objectives were to analyze body composition of professional dancers.

Materials and methods: The sample is of 18 subjects (9 men and 9 women) whose average age was 29.15 ± 4.37 years. Following the signing of informed consent, were first conducted a study anthropometric following the protocol restricted ISAK-GREC-FEMEDE completed a study of bioimpedance tetrapol Body start 1500. Both indirect methods doubly determined body composition.

Results: There is a clear dominance of the component muscle and bone on the fat, both men and women. Data provided by both methods differ statistically significant higher values on those used by the electrical bioimpedance in the three compartments (residual, fat and muscle), with kg of muscle mass compartment with greater discrepancy. The percentage of fat mass obtained by cineantropometría is in the value limit of 12% figure for the sample of women.

Conclusion: 1. The methods used to determine body composition approximate values are far from real and it is therefore necessary to interpret the data as estimates and not as absolute values 2. The predominance muscle is typical of physical activity developed 3. The fatty component is associated with physical activity where the aesthetic is a key factor in performance. 4. It should complete studies of nutrition and fluid intake for better assessment.

Key words: Kinanthropometry. Dancers. Impedance.

Sample entropy in the analysis of static equilibrium with dynamometric platform in healthy people

Algaba del Castillo José¹, De la Cruz Torres Blanca², Naranjo Orellana José², Centeno Prada Ramón A², Beas Jiménez Juan de Dios².

¹Universidad de Sevilla. Departamento de Podología. Sevilla,

²Centro Andaluz de Medicina del Deporte. Sevilla

The aim of this study was to determine the Sample Entropy values (SampEn) during the analysis of static equilibrium in healthy people.

We have studied 12 healthy subjects (5 males y 7 females) 18 to 25 years old. The gravity centre projection over a dynamometric platform was recorded both with open and closed eyes during a relaxed and static bipedal position. The test had duration of 60 seconds with a sampling frequency of 60 Hz, obtaining 3600 points for every record.

We analyzed the total displacement, the dispersion and displacement of the signal on X and Y axis, the total swept area and the maximal force in every axis. SampEn was calculated from the original X and Y series.

All lineal parameters are higher when they are recorded with closed eyes, although the difference is significant only for the total swept area and the values related to Y axis.

SampEn values for X axis are 1.53 ± 0.39 (open eyes) and 1.53 ± 0.53 (closed eyes). For Y axis they are 1.37 ± 0.42 and 1.06 ± 0.57 respectively.

The gravity centre performance over Y axis is more predictable than over X one, and more with closed eyes. The entropy value in X axis indicates that the system maintains a high complexity and that it remains constant even if the eyes are open or closed.

Key words: Static equilibrium. Sample Entropy.

Biomechanical and baropedometric analysis of the foot in professional dancersVera Ivars P¹, Torres Cuenco R², Barrios Pitarque C³

¹Podology Department. University of Valencia; ²Physiotherapy Department. University of Valencia; ³Surgical Department. University of Valencia

Introduction: Professional Dance is a highly sacrificed and demanding sport. Children from early childhood dedicate 3-5 hours daily (based on its level). Continuous heavy training causes excessive muscles, joints and ligaments overloading in bodies that are still growing. The present study was aimed at analyzing biomechanical alterations and its baropedometric repercussion on lower limbs of girls involved in professional dance.

Material and methods: A group of 21 professional dancers of the Valencia's Music Conservatory ranging in age from 15 to 18 years was included in the study. An age-matched group of 16 girls who never performed dance was used as controls. Girls underwent a static and dynamic biomechanical exam of the lower limbs making an exhaustive kinetic exploration of articular ranks, muscular alterations, conditioned posture and dynamic step study. Furthermore, a baropedometric study was performed by means of a foot insole pressure recording system (Biofoot® 6,0). Pressures were recorded during a 6-second walk.

Results: The most relevant biomechanical findings in dancers included: hip external rotation (55% of the cases), shortening of the posterior muscles chain (38%), rigidity in first metatarsian (66%), podal pathologies (77%) (forefoot 53%, hindfoot 9.5%, midfoot 4.7%, hindfoot and forefoot 14%), and varus stress during gait (33%). In dancers, baropedometric recording showed the highest pressures in hindfoot (470Kpa) and in the first finger (401Kpa). Total wear pressure of both foot exceeded in more than 600 Kpa as compared to control girls. Foot pressures were progressively higher as the number of training hours increased (2200 kPa in 15 hrs; 2500 kPa in 20hrs; 2650 kPa in 25hrs). The amount of foot load was dependent of midfoot trend position during gait (4000 kPa in inversion; 5000 kPa in eversion; and 6000 kPa in physiological trend).

Conclusions: A deeper insight of foot biomechanics in dancers has been here provided by baropedometric analysis. These girls showed a different lower limbs kinetic pattern than controls, which is expressed by a particular plantar load distribution as compared with control girls. This feature may have a critical influence in their biomechanical development.

Key words: Dance foot. Baropedometric. Biomechanics.

Baropodometric dynamic study in Champion's League soccer playersVera Pablo¹, Albors Juan², Barrios Carlos³

¹Podology University Clinic, Valencia University; ²Villareal C.F. Medical Service; ³Department of Surgery, Valencia University Medical School

Introduction: Many overload lower limb injuries in top athletes have been related with biomechanics alterations in plantar loading. In order to know the plantar pressure distribution in elite soccer players, their relationship with anatomy structures and the specific physical requirements for each position in the field, a baropodometric study was performed.

Method: Dynamic foot pressure measurements were analyzed in 21 soccer players of Champion's League. Average age was 27 years, height 180,9 cm, weight 76,9 kg and BMI 23,4. An insoles system (Biofoot®/IBV) with telemetry transmission information was used to record the pattern of plantar loadings. The plantar surface of foot was divided in 3 zones (hindfoot, midfoot, forefoot) that, in turn, were divided in 3 subareas (internal, central and external). Dynamical measurements were recorded during normal gait and running. The baropodometric data were related with different parameters like foot morphologic type, digital and metatarsal alignment, size of the footwear, and field position.

Results: Players's feet were found to bear a load average of 7820 kPa by walking and 10867 kPa by running. In both task, the highest pressure zone was the central metatarsian subarea (1700 kPa walking, 1800 kPa running) and the lowest pressure was found in the external metatarsian subarea (500 Kpa walking, 700 kPa running). Higher weight increase total pressure (72.50kg-1000 kPa, 75.00kg-1250 kPa, 77.50kg-1400kPa). The foot type influenced plantar pressures pattern: in the central metatarsian zone, players with flat foot changed from 1086 kPa of pressure (walking) to 1490 kPa (running) (37 % of increase). On the contrary, players with cavus foot changed from 877 kPa to 1804 kPa (105 % of increase). Forwards had highest loading in internal metatarsian subarea (1840 kPa mean). Defenders, and mid-fielder showed the highest pressures in the middle metatarsian subarea (mean 1570 kPa).

Conclusion: This study supports the importance of the baropodometric studies in top athletes in order to improve biomechanics strategy to prevent overload injuries. Simple redistribution of plantar pressures may induce changes in the muscular activity of lower limb and, consequently, in contact, stabilization and propulsion phase.

Key words: Baropodometry. Soccer. Foot.

Temporal analysis of the start at Sierra Nevada's World Cup 2008

De la Fuente Caynos Blanca¹, Martínez Martínez Luis¹, Ruz Fernández Gema¹, Arguelles Cienfuegos Javier¹, Gómez-López Pablo J.², Hernán Rupérez Olmo³

¹Centro de Alto Rendimiento de Sierra Nevada. Consejo Superior de Deportes; ²Departamento de Educación Física y Deportiva. Universidad de Granada; ³Centro Especializado Tecnificación Deportiva en Deportes de Invierno de Sierra Nevada. Federación Andaluza de Deportes de Invierno

Skicross will stand as a new Olympic discipline in Vancouver 2010 (Canada). The disciplines's particularity lays on the simultaneous participation of 4 skiers competing on an uneven track, changing change-directions and jumps, up to the finish. Video analysis on different championships and the competition development by itself have proved that, most of times, the fastest 2 skiers in the start are those who get to the next round. In this report, a temporal analysis is carried out over the world's highest-levelled skiers that took part at Sierra Nevada's World Cup, held in February 2008.

A protocol based on one-direction photoelectric cells, placed at 7'5 and 15 meters far from the start gate, along with synchronized frontal and lateral video record, was designed to do the research.

The obtained results suggest a significant correlation between the start time (especially on the first 7'5 meters) and the final women rank. The fewer correlation existing in boys would have been caused to the risky way they face jumps, so the theoretical advantages taken in the start go away for being balanced by jump times, whereas women are more conservative in that point.

Key words: Temporal analysis. Start technique. Skicross.

BIOMECHANICS-I LANGUAGE: ENGLISH

Electromyographic analysis of three shoulder muscles using wavelet transformation and spherical separation

Frère J^{1,2}, Huber C¹, Nüesch C¹, Fischer M^{1,3}, Göpfert B¹, Wirz D^{1,3}, Friederich NF³

¹Laboratory for Orthopaedic Biomechanics (LOB), University of Basel, Switzerland; ²Centre d'Etudes des Transformations des

Activités Physiques et Sportives (CETAPS – EA 3832), University of Rouen, France; ³Dept. for Orthopaedic Surgery, Kantonsspital, Bruderholz, Switzerland

Introduction: The Wavelet-Transformation of Electromyograms (WT-EMG) and Spherical Separation open new opportunities in EMG-Analysis. The 2 methods allow to average and group inter- and intra-subject differences in the muscular activation pattern.

The aim of this study was to identify the activation patterns of three shoulder muscles in expert fencers.

Methods: Kinematics of the whole body (VICON MX™, 240 Hz) and EMG data (Biovision, 6000 Hz, SENIAM-Standard) of the *M. deltoideus anterior* (DA), *M. infraspinatus* (INFR) and *M. triceps brachii* (TRI) of the weapon shoulder were recorded for 4 male expert fencers and 4 male fencers of the Swiss national team. Data of 10 trials/subject were averaged using EMG Wavelet-Transformation (WT-EMG). Four key events divided the flèche: the start of the movement (MS), the maximal elbow extension (MEE), the hit of the target (HT) and the maximum bending of the épée (MBE). Spherical Separation of the EMG-Spectra was computed to test the difference in the muscular activation pattern between the 2 groups. A binomial test using $p = 0.5$ with a level of significance of 95% was used to verify the separability.

Results: The separability of the Spherical Separation was 100%. The Mean Total-Intensity of the three muscles differs between groups (Figure 1).

Conclusions: Spherical Separation of EMG-Spectra confirms the difference in the flèche strategy and Mean Total-EMG intensity patterns. The national team members show a higher muscular activation of the DA than the expert fencers. DA is the primary activator of the arm extension, helped by TRI. DA and INFR work in synergy for the shoulder elevation: A high activation of the DA induces a low activation of the INFR and the inverse.

Key words: Fencing. Wavelet-transformation. Spherical separation.

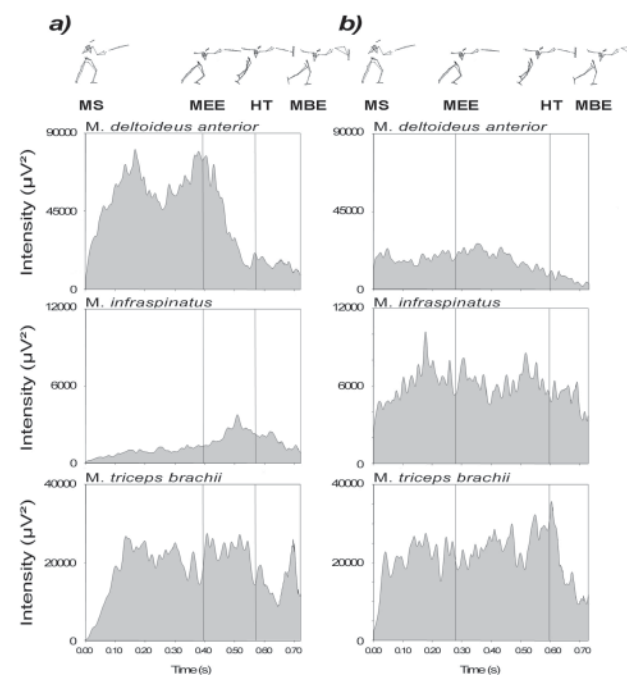


Figure 1. Frère J, et al. Mean Total-Intensity of the three muscles for a) the national team and b) the experienced group

Dual-mode dynamic functional stiffness of swine-elbow cartilage

Frère J^{1,2}, Ardura Garcia H^{1,3}, Daniels AU¹, Göpfert B¹, Wirz D¹

¹Lab. for Orthop. Biomechanics (LOB), University of Basel, Switzerland. ²Centre d'Etudes des Transformations des Activités

ORAL COMMUNICATIONS

Physiques et Sportives (CETAPS – EA 3832), University of Rouen, France. ³Biomed. Eng. Department, U. Iberoamericana, Mexico City, Mexico.

Introduction: Joint cartilage is a dual network composed of crosslinked collagen fibres and aggrecan- bound water containing chondrocytes. Consequently, cartilage mechanics are not linearly elastic. Instead stiffness parameters of cartilage (i.e., aggregate E-modulus and loss angle) depend on deformation frequency or rate. At slow (nutritional) loading rates, cartilage behaves like a poro-visco-elastic solid – water is pressed in and out of the structure. At fast (gait) loading rates (>40 Hz) cartilage behaves almost like a linear elastic solid¹. The aim of this study was to compare the properties of cartilage at slow and fast loading rates.

Methods: To simulate a fast, gait-like mode (G-Mode), 10 Single-Impact Micro-Indentations (SIMI)² were performed on 9 fresh pig elbow specimens. The equivalent frequency at impact was ~350Hz. Slow loading rates, nutrition-mode (N-mode) were accomplished with a Synergie 100 MTS[®] programmed to performed a series of single sinusoidal cycles at 0.1 Hz under displacement control. Three cylindrical plugs were harvested in the Lateral (LCH) and Medial Condylus Humeri (MCH) and two in the *Incisura Ulnae* (LIU and MIU). Dynamic elastic modulus (E^*) and loss angle (ϕ) were measured. Wilcoxon statistical tests were performed.

Results and Conclusions: The mode of measurement (G- and N-mode) showed significant differences for all plug locations for $|E^*|$ as well as for ϕ (Figure 1).

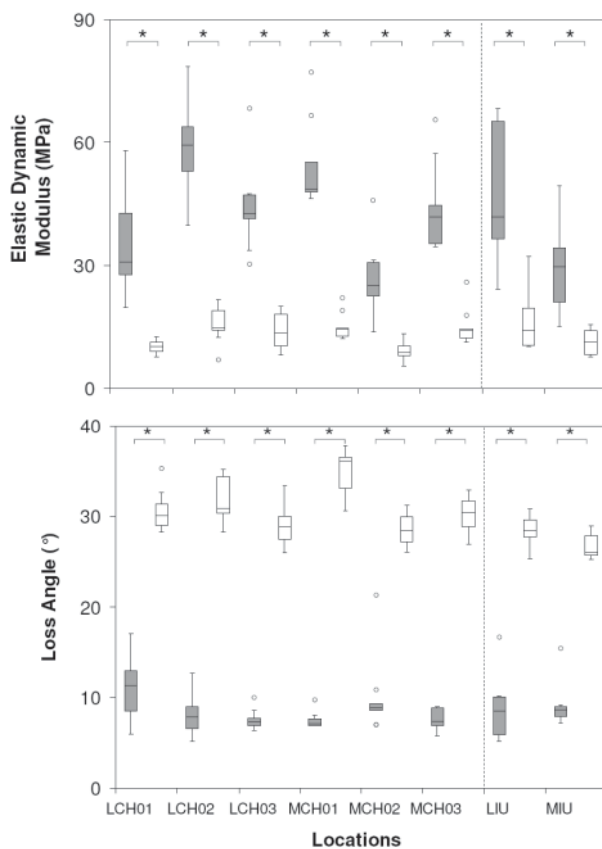


Figure 1. Frère J, et al. Boxplots among the different plug locations for the G-mode (grey boxes) and N-mode (white boxes) condition. *: $P < 0.05$

The measurements confirm results for pig knees³: cartilage tissue stores more energy under high speed impacts – e.g. during sport activities – than during the nutrition process.

References

1. Park S, et al. *Osteoarthritis and Cartilage* 2004;12:65-73
2. Vriend NM, Kren AP. *Polymer Testing* 2004;23:369-75.
3. Ardura-Garcia H, et al. *European Cells and Materials* 2008;16:7.

Differences of bone lose between cortical and trabecular bone in 4 weeks simulated hindlimb suspension rats

Changsun Kim¹, Dongho Park², Shineon Lee³

¹Department of Sport for All, Gyeongju University, Korea. ²Department of Exercise Sports & Leisure Studies, Inha University, Korea. ³Department of Physical Education, Kyung Hee University, Korea.

Background: Mechanical forces play a pivotal role in maintaining bone mass. Weightlessness and microgravity mainly lead to bone loss but this mechanism is not fully understood. Hindlimb suspension immobilization has long been employed to induce a pattern of osteopenia in rats and it has been used as a ground-based model for the microgravity or spaceflight.

Purpose: This study was designed to clarify the differences of bone loss between cortical and trabecular bone in 4 weeks simulated hindlimb suspension rats.

Method: Thirty 8-week-old female sprague-dawley (SD) rats were randomly divided into five groups and completed hindlimb suspension for two or four weeks: baseline control group (n=6, BC), 2 weeks vivarium control group (n=6, 2WC), 2 weeks suspension group (n=6, 2WS), 4 weeks vivarium control group (n=6, 4WC) and 4 weeks suspension group (n=6, 4WS). After two or four weeks of suspension, the rats were sacrificed and femurs were removed for analysis of bone mineral density (BMD) by dual energy X-ray absorptionmetry (DEXA, Lunar DPXL, USA) and peripheral quantitative computed tomography (pQCT, XC-960, Germany). The rats were fed standard lab chow (CRF-1, Charles River, Japan) and water *ad libitum* while control animals were pair fed with the appropriate suspension rats for control of caloric intake.

Results: The cortical BMDs (mg/cm³) measured by pQCT of 2WC and 4WC were increased approximately 4 and 8% compared with the BC, respectively ($p < 0.001$). Those of 2WS and 4WS, however, were not increased (NS) and approximately 4 and 7% lower than those of 2WC and 4WC ($P < 0.01$, $P < 0.001$) respectively. Similarly, although the BMDs (mg/cm³) measured by DEXA of 2WC and 4WC were also increased compared with the BC ($p < 0.001$), those of 2WS and 4WS were not increased (NS). However, the trabecular BMDs (mg/cm³) of intergroup showed similar level (NS). The femoral weights of 2WS and 4WS were decreased approximately 8 and 9% compared to the age matched control rats ($p < 0.05$), respectively, but femoral length showed no difference between any control and suspended groups. The serum calcium (Ca) concentration, urinary Ca and urinary deoxypyridinoline (Dpd) excretions of all intergroup showed similar levels. However, urinary phosphate (P) excretion of suspended rats dynamically decreased approximately 40% at both weeks ($p < 0.05$) while serum P concentrations slightly increased ($p < 0.001$, $p < 0.05$).

Conclusions: These results suggest that exposure to a microgravity environment induces spontaneous osteopenia in mainly cortical bone, and this osteopenia might be caused by disturbed P homeostasis.

Key words: Bone mineral density (BMD). Hindlimb suspension. Rat. pQCT. DEXA.

Evidence of ligamento-muscular reflexes in dynamic stabilization of the wrist

Ljung B-O¹, Bentley L¹, Hagert E²

¹Department of Hand Surgery, Inst of Clinical Sciences, Sahlgrenska University Hospital, Göteborg, Sweden. ²Karolinska Institutet, Department of Hand Surgery, Stockholm Söder Hospital, Stockholm, Sweden

Introduction: Stabilization of joints is a result of mechanical stabilization by ligaments or muscular compression of the joint components. The wrist is a good example of a system of joints where the radiocarpal stabilization is dependent on an optimal muscular recruitment at different angles, angular velocities and stress levels. The capacity to coordinate and recruit exactly the right muscles at exactly the right time is critical. In a wide-ranging research project, the interplay between the ligaments, nerves and muscles has been studied with the wrist as a model. Earlier results have demonstrated that the radial wrist extensors, two muscles with nearly the same position, differ in characteristics in that the ECRB is designed for force generation in a neutral position and the ECRP is designed for velocity and excursion over a wide range of motion. The innervation of the wrist ligaments varies and the ligaments can be divided into mechanically and sensorily important ones.

The aim of this study was to investigate a possible interaction between the sensorily important wrist ligaments and the muscles as an expression of a proprioceptive feedback system.

Method: 9 healthy volunteers were investigated by intraligamentary stimulation of the scapholunar interosseous ligament (SLIL) and the muscular response was measured by EMG of the ECRB, ECU, FCU and FCR. By using ultrasound guidance a fine-wire electrode was inserted into the dorsal SLIL and 4x1 ms pulses at 200 Hz were given. The average EMG from 30 consecutive stimulations was rectified and analyzed using student's t-test, where the pre-stimulus baseline activity (t_1) was compared to the post-stimulus EMG activity (t_2).

Results: Statistically significant ($p < 0.05$) changes in post-stimulus EMG activity (t_1 , t_2) were observed at various time intervals. Within 20 ms, a reflex excitation was seen in FCR/FCU in extension, radial and ulnar deviation, and in ECRB in flexion. Cocontractions between agonist/antagonist muscles were observed, with peaks around 150 ms after stimulus.

Conclusion: The results imply evidence for ligamento-muscular reflexes and a proprioceptive function of the scapholunar interosseous ligament. The early motor response may have joint protective functions, while the later cocontractions indicate supraspinal control to enhance neuromuscular stability of the wrist.

Key words: Wrist ligaments. Proprioception. Dynamic stabilization.

Prone position in knee flexor and extensor muscle isokinetic evaluation. Preliminary study

Coll-Fernandez R, Chaler J, Torra M, Quintana S, Garreta R
Hospital Mútua de Terrassa. Terrassa. Barcelona. Spain

Introduction: The aim of the study is to evaluate the test-retest reliability of isokinetic strength measurement of knee flexors and extensors in prone position.

Material and methods: Thirteen male volunteers were evaluated. Isokinetic evaluation protocol was carried out with Cybex Norm (TM) (Rokonkoma NY) in prone position for concentric and eccentric contraction modalities at angular velocities of 20°/s, 80°/s and 120°/s, respectively through a 40° range of movement. Peak torques and knee flexors/extensors ratios were evaluated for each velocity and contraction modality. Quadriceps concentric and hamstring eccentric ratio (i.e. dynamic control ratio) was also evaluated for each velocity. Test-retest reliability of peak torques and ratios was evaluated using intraclass correlation coefficients (ICC).

Results: All peak torque registers ICC values (ranging between 0.7018 and 0.9626) were statistically significant and indicated that peak torque measurement was reliable.

Agonist-antagonist ratios in concentric modality at 120°/s, agonist-antagonist ratio in eccentric modality at all velocities and dynamic ratio at 80°/s and 120°/s ICC values were statistically significant indicating reliability.

Conclusions: Knee flexor and extensor muscle isokinetic strength evaluation in prone position is a highly reliable test. Ratio reliability could not be demonstrated for all velocities and contraction modality in this sample. Probably, the inclusion of more subjects will correct this last finding.

Key words: Prone position. Isokinetic. Rehabilitation.

BIOMECHANICS-II

LANGUAGE: ENGLISH

The use of a GPS as a measurement tool of velocity in a progressive test. Application on a wheel-chair athletics test

Ferrer V¹, Juray MM², van Nieuwenhuizen MTM², Banquells M¹, Drobnic F^{1,3}

¹Olympic Training Center (CAR), Barcelona, Spain; ²HBO Haagse Hogeschool-The Hague Human Kinetic Technology; ³Medical Services FC Barcelona

Introduction: Determination of velocity during the tests is sometimes depending on the correct wheel measurement and the friability of the speedometer system used on the wheel chair or bicycle. Modern GPS, and also other devices as pulsometers with GPS have arrived to the athletics measurement field. Validation and usefulness of those systems are needed.

Table 1. Ferrer V, et al.

Mean (std)	Mean m/s	Std
Medium Velocity GPS	20,69	3,59
Medium Velocity Photocells	20,54	3,56

Error: Std: 0,077; Mean: 0,145

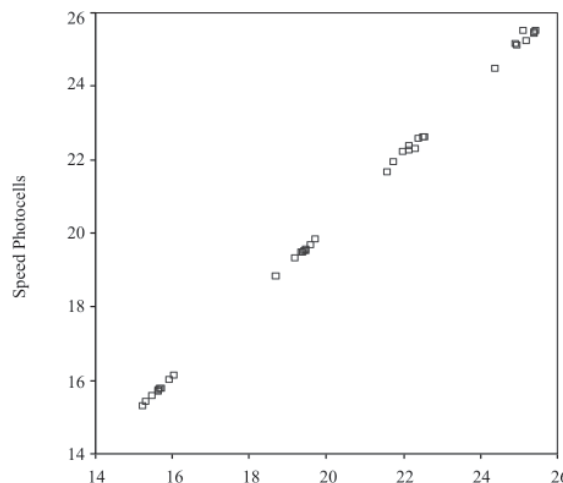


Figure 1. Ferrer V, et al.

Objective: Validate a GPS system to control mean velocity during a progressive exercise test. A second objective is the applicability of this system on a field test on wheel chair athletes.

Method: We use a GPS system – SPI 10, for photoelectric cells Tag Heuer with telemetry, chronoprinter, an odometer and a bicycle. The track field was measured on the first road with the odometer and was 402,60m. From one cell to other the distance was from 0cell to the first 101,3m: from the 1 to the 2nd 100m: from the 2nd to the 3rd 101,3 and from the 3rd to the 0 100m. To locate the cells by the GPS stayed stopped during 15 seconds on every cell (0 to 4th). The test consisted on cycling at four different velocities for 2 laps (800 m) maintaining a constant velocity on every lap. First lap 15 - 16 Km/h, 2nd lap 19 - 20 Km/h, 3rd lap 22 - 23 Km/h, and 4th between 25 - 26 Km/h.

Results: Table 1 and Figure 1.

Discussion/Conclusions: Velocity obtained from the GPS used, shows a correct correlation with the velocity measured by the photocells for all the velocities explored.

The use of GPS seems very useful for athletes who use wheels for their sport on training, testing or competition.

Key words: GPS. Velocity. Wheel-chair.

Lymphocyte DNA damage before and after a sub maximal exercise: well-trained against recreational cyclists

Barranco Y, Gutiérrez-Ríos P, Arguelles V, Soliani T, De la Plata J, Gallo M.A, Huertas JR.

Institute of Nutrition and Food Technology, Department of Physiology, Faculty of Physical Activity and Sport Sciences, University of Granada, Spain

Introduction: Regular physical exercise is recognized to have many beneficial effects including reduction in the risk of both myocardial infarction and stroke, reduction in blood pressure, improved glucose tolerance, and decreased risk of osteoporosis. However, there has also been concern that these benefits may be outweighed by the production of free radicals and oxidative stress which is recognized to occur during physical exercise, particularly when the exercise is strenuous and erratic.

Objective: To determine what type of sport practice, well-trained or recreational, generates an optimal oxidative profile for the health of the sportsman.

ORAL COMMUNICATIONS

Materials and methods: Twelve healthy, well-trained or recreational, male cyclists were selected from volunteers who offered to take part in this study. Inclusion criteria included an age range between 18 and 25 years, the absence of clinical signs or symptoms of infection, cardiovascular disease or metabolic disorders and a minimum weekly training. The subjects were tested for a sub-maximal progressive exercise (Submaximal working capacity, PW170) on cycloergometer (Cardgirus Medical-Pro, Madrid, Spain). Five milliliters of blood was drawn from the antecubital vein of each subject while in the seated position on two occasions: pre-exercise (PRE) and immediately post-exercise (IPE). DNA damage in lymphocytes was evaluated using the alkaline single-cell microgel electrophoresis ("comet" assay). The extend of DNA damage was quantified by measuring the distance of DNA migration from the body of the nuclear core ("Tail DNA") and as the product of the tail DNA and the fraction of total DNA in the tail ("Olive Time Moment"). The results were represented by the mean and the standard error. Differences were evaluated by Student's t-test. p less than 0.05 was considered significant. Data were analyzed using SPSS statistical software package (SPSS for Windows, 14.0S SPSS Inc. Chicago, IL, USA).

Results and conclusions: These results showed a significant increase of lymphocyte DNA damage in recreational vs. well-trained cyclists at pre-exercise situation. After the submaximal effort, the results have a slight tendency to increase but they are not significant (Table 1).

Table 1. Barranco Y, et al.

	Group	Tail DNA	Olive Time Moment
Well trained	PRE	12.2 1 ± 2.92	0.07 ± 0.01
	IPE	14.29 ± 2.65	0.09 ± 0.02
Recreational	PRE	15.53 ± 1.81	0.14 ± 0.04*
	IPE	15.0 4 ± 1.68	0.1 5 ± 0.03#

Values are means ± SEM. * $p < 0.05$ versus PRE-Well trained. # $p < 0.05$ versus IPE-Well trained

These values suggest that there are not adaptations in the antioxidant defense mechanism in recreational group as consequence as an irregular training and/or a low antioxidants content in the diet.

Key words: Oxidative stress. Lymphocyte DNA damage. Comet assay.

Importance of double bundle in the anatomy of ACL

Maestro A, Del Valle, Álvarez A, Rodríguez L, Fdez Lombardía J, Iglesias R, Paz A, García P, Meana A, Martínez Ríos S.

FREMAP. Hospital Cabueñes. Real Sporting de Gijón SAD

It is classically known biomechanical behavior of ACL based on their anatomical available in two bundles, one anteromedial (AM) and another posterolateral (PL). A total of 16 patients were studied -32 knees- by mean of the dissection of the ACL and testing of its size and insertions.

Also was made the measure of the maximum manual instrumented laxity before and after the section of one or the other bundle, in order to know the biomechanical behavior.

It has been confirmed bundle femoral insertion in 31 knees and a third bundle was found on one knee.

The insertion in the internal dimension of the external femoral condyle was performed in a wide area, with a vertical axis and lifting of a size 18,1 ± 2,1 and 9,2 ± 1,7 of width.

The tibial attachments of the ACL provides a big area close the spine, with a long axis of anterior and posterior of external to internal, and with a size between 16-19 mm and 9-12 mm in width.

The independent section of one or another bundle, was showed that the stability provided by the AP bundle was the anterior laxity, and rotational for the PL.

After studies in cadaver can be considered a big area of attachment, and a tibial insertion like a "pearl". Both attachments axis are on a biomechanical way to allow the roll of both bundles.

The rotational stability is determined primarily by the PL issue.

The improvement of rotational stability after double bundle ACL reconstruction

Maestro A, Rodríguez L, Fdez-Lombardía J, Paz A, Iglesias R, Martínez Ríos S, Meana A, García P.

FREMAP. Hospital de Cabueñes. Real Sporting de Gijón.

The goal is to evaluate the clinical and stability of the knee after ACL double bundle reconstruction (DB), compared with a control group of concurrent patients operated on by usual single bundle reconstruction (SB).

Material and Methods: We recruited a total of 35 consecutive patients operated by mean of hamstrings through DB and selected 36 patients as control group. The mean follow-up was 25.37 ± 1.1 months the DF group and 29.4 ± 4.03 for the MF. Identical surgical team and protocol of rehabilitation was done. The results were evaluated with IKDC objective and subjective scale and a statistical study of the qualitative primary and secondary variables was made.

Results: The SB Pivot Shift was 63.9% of cases Type A and 36.1% Type B or C, compared with 91.4% type A and 18.8% Type B or C on SB group (Pearson Chi-square = 7.71, $df = 1$, $p = 0.005$). The residual antero-posterior laxity after the SB was of 2.31 ± 0.74 mm versus 2.40 ± 1.10 mm in DB (U Test Mann-Whitney, $z = 0.714$, $p = 0.475$. NS.). The functional test of the DB technique showed a 80% of type A and 20% type B or C, while in the SB was a 13.9% type A and a 83.4% rate on the Type B or C.

The average time of tourniquet was 68.67 ± 10.3 minutes in the SB and 82.23 ± 11.9 minutes in the DB (student t : $t = -5196$, $p < 0.0005$). The subjective IKDC in the DB group was 88.23 ± 4.27, and the group of SB 82.17 ± 3.86 (Student t test, $df = 69$, $t = -6268$, $p < 0.0005$).

Conclusions: There is an improvement in the rotational stability in DB group, as well as the subjective assessment of the patient, emphasizing a more surgical time employee.

Key words: Double bundle. ACL. Reconstruction.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-I LANGUAGE: SPANISH

Psychometric properties of spanish version of visa-p for patellar tendinopathy in athletes: preliminary results of validation study

Hernández Sánchez S¹, Poveda Pagán EJ¹, Gómez Conesa A².

¹Physiotherapy Area. Miguel Hernández University. Pathology and Surgery Department. mSan Juan (Alicante). Spain; ²Physiotherapy Department. Murcia University. Campus Espinardo. Spain

Introduction: Obtaining of scientific evidences it's a growing need in Sports Sciences. In this way, the use of validated scales and questionnaires can help us to collect, analyze and objectify clinical information.

The aim of the study was study preliminary psychometric properties of the Spanish version of VISA-P scale for patellar tendinopathy in a pilot sample of athletes with and without this injury.

Methods: First of all a transcultural process described by Beaton al cols was carried out.

The spanish version of VISA-P was administered to all 47 participants with mean age of 24.1 years DT 4.76 years (37 men and 10 women) designed in three groups: health, risk and pathology. Previously all subjects completed informed consent to participate in the study.

We used SPSS 15.0 for statistical study.

A reliability analysis was carry out to assess internal consistency (Cronbach alpha coefficient), test retest stability (intraclass correlation coefficient) and item's homogeneity.

For construct validity the factor structure of spanish version was analyzed with principal components analysis, Varimax rotation. To discriminative validity an ANOVA test was used and Tukey's posthoc method was applied to establish group differences' meaning.

Results: Cronbach alpha coefficient: 0.825

Intraclass correlation coefficient (ICC): 0.981 (IC=95%, $p < 0.05$).

In the factorial analysis, a solution with two factor explained 76% of variance. Although every item, except 7 are associated with the first factor (pain).

There are significantly differences in mean average of health and risk groups respect to pathology group.

Conclusions: Preliminary data of validity and reliability of VISA-P Spanish version are satisfactory, although we must confirm these results in a sample with more subjects.

Spanish version of VISA-P could be used to as a useful tool to assess clinical changes in athletes with patellar tendinopathy.

Key words: Spanish version. Validation. VISA-P scale.

Shortened hamstring treatment: a meta-analysis

Días Rosane, Gómez-Conesa Antonia, Sánchez-Meca Julio
Facultad de Medicina. Departamento de Fisioterapia.
Universidad de Murcia

Background: The shortening hamstring is related to genetic factors, daily habits and sports activities, above all in sports of short run and that favor the inflection of knees. In practice clinical, the lack quantified of evidences complicates to establish what type of processing contributes more efficient results. This work presents a meta-analysis on the efficacy of treatment for the shortened hamstring in healthy subjects.

Methods: Computerized bibliographic searches of MEDLINE, EMBASE, PEDros, LILACS, and the Cochrane Central Register of Controlled Trials were supplemented with additional database and manual searches of the literature. The literature search enabled us to identify 5 studies published between 1930 y 2007 that fulfilled our selection criteria, giving a total of 11 independent comparisons between a treated group and a control group. The effect size index was the standardized mean difference in the posttest.

Results: The meta-analysis reflected a statistically significant effectiveness ($d^+ = 1.1040$ 95% confidence interval 0.342 to 1.867), the different treatments employed (stretch and other) are effective, without statistical differences among them. The homogeneity test of the effect sizes was significant ($Q_w = 75.272$; $p = 0.000$), the results were influenced by moderating variables (age, sex, methodology quality, among others).

Conclusion: The flexibility treatments to shortened hamstring shortened, applied in the population studied are efficient. They were more beneficial when employed in subjects of the feminine gender, the more young be the subjects and when a greater number of weeks is utilized.

Key words: Flexibility. Hamstring. Treatment.

Ultrasound study presurgical of suitability of pes anserinus for anterior cruciate ligament reconstruction

Jiménez F¹, Barriga A¹, Rubio JA¹, Ramos D¹, Cotarelo J², Goitz H³, Bouffard A³

¹Sports Central Investigation Unit. Sport Sciences Faculty. Castilla la Mancha University. Toledo. Spain; ²SOLIMAT Hospital. Toledo. Spain; ³Henry Ford Health System.

Introduction: There are recent ultrasound studies orientated to the evaluation of the empty space generated by the extraction of the tendon of the semitendinosus in the surgery of the ACL (Baro F, 2001). The good regeneration was verified, though they are late about 18 months in reaching a thickness slightly superior to the counter wings. In this study there was also demonstrated that the fibers are orientated, though the muscle was broader and shorter.

Nevertheless there are no studies that prove the surgical suitability of the tendon of the pes anserinus in the ACL reconstruction.

Materials and methods: The ultrasound measurements are realized in 6 patients, with the knee in flexion of 90 °, to quantify the thickness of the tendon of the semitendinosus (SMT) and gracilis (G), in a point placed to 2 cm, below the miotendinosus union of both muscles. The same technician with 10 years of experience realizes all the explorations and they are carried out the same day of the intervention. The complete examination includes 2 diameters and 3 measurements, the average values the exploration being obtained. Previous extraction of the tendon the same person realizes the surgical measurement, the information of the same one being annotated.

Results: Later the ultrasound dates is compared with the information of the surgical measurement having been verified the absence of statistical significant differences (Table 1).

Table 1. Jiménez F, et al.

Ultrasounds	Measurements	Surgicals measurements
SMT 1º diameter	6.5±0.1 mm	6.3±0.2 mm
SMT 2º diameter	5.9 ±0.3 mm	6.1±0.1 mm
G 1º diameter	4.1±0.2 mm	4±0.1 mm
G 2º diameter	3.8±0.1 mm	4.1±0.2 mm

Conclusions: The presurgical applications of ultrasound scan includes the measurement of the thickness for reconstruction establishing the suitability of the tendons of the pes anserinus for surgery of the ACL. Specially in the cases of doubtful palpations of tendon fundamentally in obese patients or with very high IMC.

Also one proposes the ultrasound study presurgery in chronic instabilities with tendinosis severe in pes anserinus and for the description of anatomical variants.

Key words: Ultrasound. Pes Anserinus. ACL.

Medical incidents and evacuation in canyoneering

Soteras I, García M, Pérez-Nievas J, Batista S, García-Lisbona J, Benjumea F, Moreda E, Bandrés I.

Unidad de Rescate en Montaña, UME Sabiñanigo. 061 Aragón.

Introduction: Canyoneering is a term used to describe an adventure sport in which narrow canyons are descended along the watercourse that combines hiking, wading, swimming, boulder hopping, rock climbing and rappelling. Today there are more people exploring canyons in more places than ever before. As interest in the sport grows, so do concerns regarding safety. Canyoneering accident prevention and control involves identifying injury patterns in this sport. Our objectives were to determine incidence and frequency of injuries related to this activity that required emergency medical system (EMS) activation in order to prevent, teach and optimize resources.

Methods: A retrospective descriptive study was done examining the medical incidents in canyoneering that occurred in the 10-year period from August 1, 1999, through July, 2008. Subjects were selected from 061 Aragon Mountain Rescue Unit database incident reports. Data collected included age, gender, type of injury, location, rescue duration, Glasgow scale, National Advisory Committee for Aeronautics (NACA) injury severity index score and treatment given.

Results: During study period more than 420 canyoneering rescues missions were reviewed, 21,5% of the total medical incidents. The mean age of patients was 33.6 years (SD: 11.8), and the group comprised 59.1% males. Emergency medical system transport required terrestrial techniques in 45,7% of injuries and 61,1% needed special rescues skills. France was the location where more often injured came from (35,9%). Traumatic aetiology was the more common reason for calling. The most significant injuries that required outside assistance involved orthopaedic trauma lower extremity (39,5%), rather than medical or environmental exposure. Splinting and opiates were administrated in 53, 9% and 13,0% respectively. Rescue duration mode was 90 minutes. 62,4 % of the accidents had NACA index higher than score (II).

Conclusions: Canyoneering rescue use a large portion of 061 Aragon Mountain Rescue Unit Service. Diagnosis at the scene has to be fast, and the most often initial treatment is based in immobilization and analgesia. Severity scores index justifies emergency medical system (EMS) at the accident scene. Well trained care givers in mountain rescue have to manage an early evacuation in the best conditions in hazardous environment. These results will help optimize resource planning, prevention and first aid training.

Key words: Canyoneering. Outdoor injury. Search. Rescue.

Longitudinal intratendinous ruptures of the peroneal tendons

Solanas J, Bada JL, Coll X, Oller R.

Corporació de Salut del Maresme i la Selva

The longitudinal intratendinous ruptures of the peroneal tendons, not related to rheumatic or tumor diseases, are not frequent pathologies. We considered that these injuries are able to be compare to the rotators tendons ruptures on the shoulder.

We present seven cases of total or partial intratendinous ruptures of the peroneal tendons. In all cases there is an antecedent of injury on the ankle with a variable interval of symptoms in the time, without previous antecedents of ankle clinic. In some cases the initial diagnosis has taken to other surgical gestures without solution of the problem. Six cases have surgical act, with diagnosis of tendinitis or enthesitis of the peroneal tendons, whereas the last case the diagnosis has been at the few weeks of the accident using RNM directed to search the injury caused by the bad evolution of the patient.

ORAL COMMUNICATIONS

The surgery treatment cases have presented a very good clinical improvement. A case has required a reintervention because a neuroma concerning the scar. The case diagnosed by RM has followed rehabilitating treatment and evertor orthoses with a satisfactory result at the moment.

We think that this type of injury can be compared to the injuries of the rotators tendons of the shoulder.

Peroneal tendons are tendons that can present a previous degenerative process. If they suffer an accident as an sprain that takes to limits the resistance of the tendon. This can take to the rupture that is longitudinal being able to affect all their length.

As in the shoulder pathology we defend the paper of physiotherapy in the starting phases but in the cases in that it has failed we think that the unique solution is the surgery with suture of the tendon and liberation of all their passage.

Key words: Peroneal tendons. Injury. Treatment.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-I

LANGUAGE: ENGLISH

Morrhuate Sodium and Hypertonic Dextrose (Prolotherapy) for Severe Lateral Epicondylitis: Clinical and Radiological Outcomes

Rabago David¹, Zgierska Aleksandra², Kijowski Rick³, Arbogast Gennie⁴, Snell Edward⁵, Scarpone Michael⁶

¹University of Wisconsin School of Medicine and Public Health, Department of Family Medicine, Madison WI, USA; ²University of Wisconsin School of Medicine and Public Health, Department of Family Medicine, Madison WI, USA; ³University of Wisconsin School of Medicine and Public Health Department of Radiology, Madison WI, USA; ⁴Riverside Sports, Spine and Fitness Center, Steubenville OH, USA; ⁵Hahnemann University, Pittsburgh PA, USA; ⁶Hahnemann University, Pittsburgh PA, USA

Introduction: Lateral epicondylitis (LE) is common significant condition in Sport Medicine. A subset of patients is refractory to standard care. Prolotherapy is an injection-based therapy for chronic musculoskeletal pain. No randomized controlled trial has assessed prolotherapy for a tendinopathy. We therefore assessed whether prolotherapy improves pain, extension and grip strength, and appearance on magnetic resonance imaging (MRI) in patients with LE.

Methods: *Design:* Double-blind randomized controlled trial. *Setting:* Outpatient Sport Medicine clinic. *Participants:* Twenty-four adults with at least 6 months of refractory LE. *Intervention:* Prolotherapy participants received injections of a solution made from 1 part 5% morrhuate sodium, 1.5 parts 50% dextrose, 0.5 parts 4% lidocaine, 0.5 parts 0.5% sensorcaine and 3.5 parts normal saline. Controls received injections of 0.9% saline. Three 0.5mL injections were made at the supracondylar ridge, lateral epicondyl and annular ligament at baseline, 4 and 8 weeks. *Outcome Measures:* Resting elbow pain (0-10 Likert scale), extension and grip strength. Each was performed at baseline, 8 and 16 weeks. MRI was performed at baseline and 16 weeks; images were rated by musculoskeletal radiologist. One-year follow-up included pain and function assessment.

Results: Randomization produce two balanced groups. Compared to Controls, Prolotherapy subjects reported improved pain scores (4.5±1.7, 3.6±1.2 and 3.5±1.5 versus 5.1±0.8, 3.3± 0.9 and 0.5±0.4 at baseline, 8 and 16 weeks, respectively); at 16 weeks, these differences were significant compared to baseline scores within and between groups (p<.001). Prolotherapy subjects reported improved extension strength compared to Controls (p<0.01) and grip strength compared to baseline (p<0.05). There was no difference in MRI scores between groups at 16 weeks. Clinical improvement in Prolotherapy subjects was maintained at 52 weeks.

Conclusions: Prolotherapy with hyperosmolar dextrose and morrhuate sodium dramatically decreased elbow pain, improved strength and was well tolerated in subjects with refractory LE compared to Control injections.

Key words: Prolotherapy. Lateral epicondylitis. Morrhuate sodium. Hyperosmolar dextrose.

Minimal-invasive treatment of femoroacetabular impingement in sportsmen. Analysis of results in 117 consecutive cases

Ribas M¹, Marín O², Ledesma R¹, Tey M¹, Cáceres E¹, Vilarrubias J¹

¹USP – Instituto Universitario Dexeus, Barcelona. España; ²Hospital Infanta Leonor, Madrid. España

Introduction: Femoroacetabular impingement (FAI) has been recently recognized as the main cause of hip pain in sportsmen. We analyse if clinical and functional results it surgical treatment are influenced by preoperative degenerative hip changes.

Material and Method: 117 FAI operated hips in 115 sportsmen with a minimal follow up of 3 years (range: 3 – 4,5) were evaluated and divided into 3 groups according to Tönnis Scala for preoperative radiological degenerative hip stages: group A 32 patients Tönnis 0, group B 61 Tönnis 1 and group C 24 Tönnis 2. A Combined Clinical Score (CCS), which includes Impingement test, Merle D'Aubigné and WOMAC scores was used and undertaken 6 weeks, 3 months, 6 months and every year after operation. With this method satisfactory and unsatisfactory results were obtained. SPSS 10.0 software (SPSS INC, Chicago, Ill) was used for statistical analysis and comparisons were performed by means of chi-squared test; p<0,05 was considered to be significant.

Results: With CCS method satisfactory results were obtained in group A (Tönnis 0) in 93,4% of cases in the first year, 96,5% in the second and 97,8% in the third; in group B (Tönnis 1) satisfactory results were observed in 91,3% of the cases in the first year, 91,2% in the second and 93,6% in the third. In group C (Tönnis 2) only satisfactory results were obtained in 58,3% of the cases in the first year, 55,3% in the second and 50,1% in the third year. Differences between groups A and B with C were significant (p<0,01), but not between groups A and B (p>0,05).

Conclusions: Surgical results depend directly on degenerative state. Thus it seems to be crucial the early diagnosis and treatment of FAI in symptomatic patients. Need to instruct sportsphysicians in the diagnosis of FAI is of paramount importance.

Key words: Osteoarthritis. Hip. Femoroacetabular impingement.

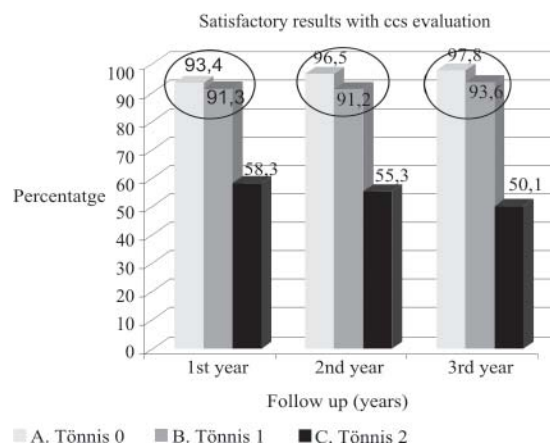


Figure 1. Ribas M, et al.

The effect of glucosamine supplementation during the rehabilitation period of anterior cruciate ligament reconstruction

Eraslan A, Ulkar B.

Ankara University School of Medicine, Department of Sports Medicine.

Introduction: There are several factors influencing the rehabilitation process of Anterior Cruciate Ligament Reconstruction (ACLR). Pain and articular cartilage damages are some of these factors negatively affecting the functional improvement.

Glucosamine derivatives are widely used in painful knee disorders either to delay osteoarthritic changes or to reduce pain arising from cartilage degeneration. We would like to investigate the effects of glucosamine supplementation to the rehabilitation outcomes of athletes who had undergone ACLR operation. The preliminary results of this study are presented.

Methods: All of the patients participated voluntarily to the study and signed the consent forms. In this randomized blind-placebo-controlled clinical study, 1000 mgs of oral glucosamine sulphate administered to half of the (GS group, n=6), whereas other half (placebo group, n=6) ingested same amount of placebo daily. Administration of the supplements and placebo began at the end of the 6th week of rehabilitation program which was representing the beginning of the full-weight bearing exercises and continued for two months. Both of these groups received the same ACLR rehabilitation protocol. All of the patients were evaluated by visual analog scale (VAS), International Knee Documentation Committee-2000 (IKDC), and Lysholm Knee Scale at the beginning and at the end of the study.

Results: All of the evaluations showed significant improvements at the end of the treatment in both of groups but no significant differences were detected in none of the parameters between the GS and Placebo groups.

Conclusion: Although it was hypothesized that glucosamine supplementation would positively affect the rehabilitation outcomes, the findings did not support this hypothesis. Glucosamine supplementation might have not been the right choice to improve the functional outcomes of ACLR rehabilitation of young competitive athletes. On the other hand, low number of subjects and dosage of the supplementation detained us to make a certain conclusion.

Key words: Glucosamine-sulphate. Anterior cruciate ligament reconstruction. Knee scoring scales. Visual analog scale.

Study of traumatic injuries in veteran fencing competitions

Naghavi Seyed Hamidreza¹, Holburn Colin²

¹Member of Medical Commission-International Fencing Federation (FIE). Specialist Registrar in Occupational Medicine, Imperial College Healthcare NHS Trust, London UK; ²Consultant Accident & Emergency, Sandwell and west Birmingham hospitals NHS Trust, UK.

Introduction: Fencing is a traditional sport with increasing participation and population worldwide, and due to the use of protective equipments (protective clothing and mask), fencing is a relatively safe sport. Qualifying age for veteran fencing is 50, and the aim of this study was to quantify the incidence of injuries in veteran fencing competitions.

Methods: This survey was undertaken during the Veterans Fencing World Championship which was held in Bath, United Kingdom, September 2006.

Results: 291 fencers took part in 1170 competitive bouts of which 176 (60%) were male and 115 (40%) were female. The mean age of athletes was 58.9 years (range 50-85). During this world championship there were 13 requests for medical attention related to injuries (wound 23%, bruise 23%, sprain 31%, spasm 15.4%).

Injury rates were 4.5 per 100 participants (95% confidence interval 2.6-7.5), and 1.1 per 100 bouts (95% CI 0.7-1.9).

Hand was the most common location of injuries (53.8%), followed by ankle (15.4%).

Six (46.2%) injuries occurred due to opponent's weapon, and functional overloading and other types caused seven (53.8%) of injuries.

Conclusions: We found that Injury rate was 1.1 per 100 bouts. In a previous study in junior fencers, the rate of injury per 100 bouts was 5, which gives a relative risk of 4.6 (95% CI 2.4-8.6) indicating that veteran fencing competitions is associated with less injury comparing with junior competitions. The results of this study emphasised that if suitable protective devices are used, veteran fencing competitions have only a low risk of accidents and injury, and that most of sport related injuries occurring in fencing can be suitably managed with first aid principles. Although occurrences of dangerous injuries, nevertheless, medical teams at fencing competition should be trained to an appropriate standard, and suitable emergency facilities must be available.

Key words: Fencing. Injury. Veteran.

Vibration energy and isotonic exercise: a new approach to functional recovery and muscle strengthening

Gualtieri E¹, Fontana F², Tranquilli C³, Battistini G⁴, Cavalieri PL²

¹Private sport traumatology centre. Cesena. Italy; ²Medicina Ravenna sport traumatology centre. Ravenna. Italy; ³National Institute of Sport Medicine and science C.O.N.I. Rome Italy; ⁴Italian Sports Medicine Federation (FMSI). National Advisor. Forli. Italy

Technology: The work described here consists in using controlled-frequency vibration, associated with an isotonic machine for the upper and lower limbs.

The systems consist in two different machines; the first for the treatment of upper limbs, who consist in a cable system with two arms whose height with respect to the ground can be adjusted, to which weights ranging between 5 and 80 Kg can be connected; the treatment of lower extremity, is possible by a leg press machine.

The vibration is controlled by means of a switchboard allowing for the production of a vibration which may be simultaneous or not, but also, more importantly, it is possible to select its frequency (from 25 to 70 Hz).

Effects of the vibration. Clinical-experimental evidence has shown:

- Improvement of the muscular functions with production of positive stresses on the biological functions of the bone, especially on the transversal axis.
- Increase in muscular power (Bosco, *et al.* 1998).
- Efficiency of treatment after trauma with peripheral neurological damage (Levitskii, *et al.* 1997).

Table 1. Gualtieri E, *et al.*

Pathology	Number of cases	Result: poor/sufficient	Result:good/excellent
Rotator cuff reconstruction	20	4	16
Cuff reconstruction + acromioplasty	10	3	7
Non-operated cuff injury	8	3	5
Tendinosis/Impiegment	17	5	12
Brachial plexus injury	6	2	4
Total upper limb	61	17	44
anterior cruciate ligament (ACL) reconstruction	4	1	3
Meniscal lesion	5	2	3
Tibiotalar joint trauma with anterior peroneal-astragallic ligament lesion	8	2	6
Common Peroneal Nerve lesion	2	1	1
Knee injuries	4	1	3
Muscular lesions (popliteus muscle and sural muscle)	8	2	6
Metatarsal fracture	3	2	1
Total lower limb	34	11	23

ORAL COMMUNICATIONS

- Improvement of the joint pain symptom (Parks HS, Martin BJ 1993).
- Effect on the Golgi tendon organs which are sensitive to stress variations (Issuring WB. 2005).
- Moreover it seems that the vibration has muscle-relaxant capacities.

The effects of the vibration therefore result in:

- Greater muscular power.
- Greater tendon elasticity.
- Greater joint flexibility.
- Improvement of vascular and lymphatic drainage.
- Improvement of proprioceptiveness.

Case studies: Table 1.

Result checks: Our experiment, aimed at proving the efficiency of isotonic exercise associated with controlled vibration, consisted in carrying out an Isokinetic Test on several individuals before and after the treatment. Intra/extra rotation was used for the shoulder, prono/ supination for the TT joint and flex/extension for the knee, because it was showed the most stable movements whose compensation did not affect the muscle performance.

Conclusion: The rehabilitation of a joint and the strengthening of the muscles involved in the movement, undoubtedly shows substantial advantages from being associated with controlled vibration in terms of reduction of the weight applied (more safety), early increase of joint excursion, reduction in the number of sessions; in conclusion this means shorter recovery times.

In the area of non-physiological stimulations, the vibrating system is the most effective in our opinion, for the following reasons:

- The same results of traditional muscular strengthening are obtained, with reduced sessions in terms of time and load.
- The system tested does not have the usual contraindications which are typical of the vibrating boards currently in use (retinal detachment, kidney stone movement, secondary neuropathy, etc.).
- It is selective (mono- or bi-segmented), thus allowing for differentiated and customised training.

Key words: Vibration energy. Rehabilitation. Muscular damage.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-II

LANGUAGE: ENGLISH

Midterm functional outcome after medial patellofemoral ligament reconstruction with hamstring autograft for patellar instability

Papapalexandris S, Dogiparthi K, VanNiekerk L

Friarage Hospital, South Tees Hospitals NHS Trust, Northallerton, North Yorkshire, UK

Introduction: The aim of this study was to assess the knee function after Medial Patellofemoral Ligament (MPFL) reconstruction with single semitendinosus autograft.

Methods: Twenty nine patients (30 knees) underwent MPFL reconstruction. The free end of the semitendinosus tendon was rerouted through the most distal part of the medial intermuscular septum proximally to the adductor tubercle, to the superomedial border of the patella, where it was fixed, whereas its distal insertion to the tibia was preserved. Clinical and radiological evidence of patellar instability and MPFL rupture or deficiency was documented prior to surgery and the knee function was assessed preoperatively and postoperatively with the use of Kujala, Tegner, Lysholm and International Knee Documentation Committee (IKDC) scores.

Results: There were 20 male and 9 female patients with an average age of 27.2 years (median age 26) ranging from 13 to 51 years. The minimum follow up was 2 years with an average of 33.5 months (range 24-54 months). All knee functional scores significantly improved postoperatively. Kujala score improved from 56 to 82, Tegner score improved from 2.8 to 6.3, IKDC score improved from 46 to 73 and Lysholm score improved from 51 to 85. One of the patients required revision of the MPFL reconstruction due to traumatic redislocation of the patella.

Conclusions: At a midterm follow-up, reconstruction of the MPFL with rerouting of the semitendinosus tendon is an effective method with improved function in all patients.

Key words: Medial patellofemoral ligament. Patella dislocation. Patellofemoral instability. Knee ligament injuries.

Dynamic analysis of gait at various times during the rehabilitation of the anterior crossed ligament

Alakdar Y¹, Garcia X², Morales J², Gomis M³

¹Department of Physiotherapy. University of Valencia. Spain;

²Department of Physical Education and Sport. University of

Valencia. Spain; ³Area of Physical Education and Sports, Miguel Hernandez University of Elche, Spain

Introduction: Gait may be affected by personal factors like age, gender, height and build; by the type and state of the ground; and by a lesion of some part of the musculoskeletal system. To be able to propel the body forwards during gait, the foot unavoidably exerts a series of forces on the ground. At the same time, the ground returns these forces with the same magnitude, but in the opposite direction and course. These reaction forces produced during gait are accountable for the body advancing, and their study is important to analyse human gait. Therefore, the objective of this work is to compare the reaction forces produced during gait in patients with a torn anterior crossed ligament at various times during the rehabilitation process.

Material and methods: The reaction forces of both legs were assessed (injured and healthy) of 11 subjects with a torn anterior crossed ligament using a dynamometric platform (NedSVE/IBV, Institute of Biomechanics, Valencia, Spain) before undergoing surgery, and at 3 and 6 months after surgery. The following reaction forces were analysed: initiation force, brake force and propulsion force. An ANOVA of repeated measurements and a multiple pairs comparison of the least significant difference were done to statistically analyse the data obtained.

Results: No significant differences were found in the reaction forces between both legs ($p > 0.05$), although differences were noted at various times during rehabilitation when both legs together were compared ($p < 0.05$).

Conclusions: As the results indicate, the three reaction forces analysed throughout the rehabilitation process improved. No differences were found between the values collected before surgery and those obtained 3 months after surgery, although those patients who underwent surgery improved after 6 months. Therefore, we can conclude that gait alters owing to a torn anterior crossed ligament, and alterations in gait are noted in both legs before surgery and 3 months after surgery, which noticeably recover 6 months after surgery.

Key words: Ground reaction force.

Table 1. Alakdar Y, et al: Comparison of reaction forces between measurements (n=22)

	Propulsion (N)	Brake (N)	Initiation (N)
Before surgery	100.51± 13.79	81.56± 16.5	772.84± 99.90
3 months after surgery	100.93± 15.95	84.17±21.49	767.11± 97.34
6 months after surgery	109.17± 17.17**	94.50±19.95**	779.22± 92.23*

The data are means±standard deviations. *Indicate the differences between before surgery and 6 months after surgery ($p < 0.05$). **Indicates significant differences between 3 months after surgery and 6 months after surgery ($p < 0.05$).

Tab tracking sports rehabilitation at a soccer player

Peirau X, Colell D, Escura J, Poblet R

U.E. Lleida S.A.D

Introduction: It is very difficult to quantify and evaluate objectively the recovery process of an injured professional football player. One of the main causes of sport's injury is an inappropriate rehabilitation or premature return (Arnasson A. 2004; Dvorak J 2004). We present a tool used in our club during the last two seasons that has allowed us to objectify the process, in order to restrict this risk factor.

Material and methods: We propose a monitoring form of the changes suffered by a footballer injured taken by Fuller's and CW J. Walker's article (BJSM 2006). Our proposal consists in 3 sections: recovery, rehabilitation and retraining; emphasizing the last two that are detailed and enclosed by objective criteria for a process control. We work with specific objectives that the athlete must overcome in order to achieve his work's level. In rehabilitation's stage are quantified mainly physical abilities while in retraining are quantified specific football skills. These allows us through a weekly assessment to identify in percentage the present situation of the injured. Considering the sports discharge, when the person reaches

100% of valuation to achieve. We bring the practical experience of the past two years in which we have used this instrument in 28 lesions in players of the first team players (48% musculoskeletal lesions, 42% ligament lesions, 8% bone lesions and 2% others).

Results: 95% of the injured players played again without any impact. The process was very much appreciated by both the player and the technical team who knew more objectively way the player's condition and it allowed for a return prognosis to competition.

Key words: Rehabilitation. Tab. Football.

Injuries during physical training in gyms. Type of injuries - treatment

Karatzas G, Stefanakis G, Theofanopoulos F, Nakos AI, Apostolopoulos AI.

Orthopaedic Department 'Asklepieion' General Hospital, Athens - Greece.

Purpose: The registration of type of injuries occurred in people during their physical training in gyms and the treatment's options.

Material & Method: Forty two (42) persons aged 25-42 years old (average: 36,2yrs) sustained injuries during their physical training in gyms. Thirty (30) were men and twelve (12) were women. Evaluation was consisted of clinical examination following by the 'necessary' imaging (X-rays, MRI-scan, U/S-scan). The type and the frequency -hours per week- of physical training were registered as well.

Results: More than 7-8 different types of injuries were sustained and treated (tendonitis, muscles injuries (sprains), tendons' ruptures, menisci tears, sprains, epicondylitis, fractures...). Tendonitis and sprains were the most common injuries. The types of injuries were related with the type of physical training. Excluding muscles strains, knee and shoulder were most frequent involved, following by ankle and wrist. Injuries were equally located in upper and lower limbs; and some of them were due to overuse. 30% of injured persons had been previously sustained injury in the same area and 45% of people were physically training more than 9 hours per week. The vast majority of injuries were treated conservatively.

Conclusions: A variety of injuries can be sustained during physical training in gyms. The types of them were related to the type of physical training. Occasional physical training as well as over-training seems to be related with the frequency and the severity of the injuries

Key words: Physical training. Gyms. Over-training.

Swelling of the knee during or following sports. Causes and treatment

Karatzas G, Nikolopoulos D, Liarocapis S, Chionis Od, Vassos Ch

Orthopaedic Department 'Asklepieion' General Hospital, Athens. Greece

Purpose: Registration of traumatic causes of swelling of the knee during or following sport activities in 'amateur' athletes' and evaluation of the treatment.

Material & Method: Fifty eight (58) 'amateur' athletes, aged 16-41 years old, (average:29,3yrs) were treated for knee swelling during or following their sport activity. In thirty three (33) cases the swelling was located in the right knee while in the rest twenty five (25) in the left. Forty six (46) athletes were men and twelve (12) were women. The injury of the knee was sustained during: soccer(16), mini-soccer(12), basketball(8), beach-volleyball(5), volleyball(4), athletics(3), ski(3), aerobic(3), karate(2), tennis(2). The protocol of initial treatment was including clinical examination, knee X-ray (F/P), knee-MRI (when necessary). The patients were followed-up for 3-15 months.

Results: Knee swelling was due to identified cause in 72% of cases (meniscus tear, ACL tear, fracture of patella, MCL tear, contusion of femoral condyle, ACL+meniscus tear, subluxation/dislocation of patella, avulsion of intracondylar eminence, PCL tear, rupture of extensor mechanism, chondral lesions), while in the remaining 28% was due to 'reactive' synovitis. Haemarthrosis of the knee was detached in 43% of the cases. Thirty (30) patients underwent knee arthroscopy. 60% of injured knees were treated surgically. In 91% of cases the results were excellent / very good.

Conclusions: A variety of injuries are the causes of knee swelling in 'amateur' athletes during or following sport activities. Appropriate treatment followed an accurate diagnosis is the key point for the successful outcomes.

Key words: Swelling. Knee. Athletes.

DIAGNOSTICS, MANAGEMENT AND TREATMENT OF SPORTS INJURIES-III

LANGUAGE: ENGLISH

The augmentation of independent bundles of ACL

Maestro A, Rodríguez L, Fdez Lombardía J, Iglesias R, Paz A, García P, Meana A, Martínez Ríos S.

FREMAP. Hospital Cabueñes. Real Sporting de Gijón SAD

The goal of these paper is to evaluate the clinical outcome after the reconstruction of one or another bundle of the ACL.

We recruited a total of 14 consecutive patients, underwent reconstruction of the AM bundle (8 cases) or PL bundle (6 cases) with the usual ACL reconstruction technique with autologous pes anserinus tendons (in 12 cases the semitendinosus and gracilis tendons were used and 2 cases only the semitendinosus was needed), with an age average 30.28±7.35 years, a length of 176±6.5 and 72±7.74 Kgrs. weight. The mean follow-up was 18.07±4.48 months, and the surgery was made by same surgical team. All patients following identical postoperative protocol. The results were evaluated by mean of the objective and subjective IKDC scale.

Results: The preoperative evaluation showed 2 cases in group D, 11 in the C and 1 in B, and the postoperative 12 group A and 2 in B.

the functional test and mobility recovery in all cases, with persistence of 1 case of Pivot Shift and an anterior laxity in group B.

There were no differences in complications or time compared to surgical techniques.

The subjective IKDC was 81.42 +4.73 preoperatively and 88.21 +4.24 postoperatively.

Conclusions: The reconstruction of one or another bundle of the ACL, allows the recovery of stability and functionality of the knee.

Radial shockwave therapy for the treatment of musculoskeletal injuries in a sports medicine clinic

Malliaropoulos N, Akritidou A, Christodoulou D.

Thessaloniki Sports Medicine Clinic

Introduction: Extracorporeal shockwave therapy has been applied for tendopathies since 10 years. The aim of the study is to evaluate the efficacy of ballistic Radial Shockwave Therapy treating various musculoskeletal injuries.

Aim: To evaluate the efficacy of Radial Shockwave Therapy for various musculoskeletal injuries

Methods: During the period September 2003-August 2007,375 patients (205 women, 170 men) with average age of 40,35 years suffering from subacute and chronic musculoskeletal injuries were presented to our Sports Injury Clinic and treated with Radial Shockwave Therapy. From those 290 had previous treatments and for 85patients was their first choice treatment. Follow up was done at 6, 12 and 24 weeks and a year after treatment. Concerning the injury location, we treat elbows 25%, shoulders (21 %), followed by the knee 9%, foot 8% and ankle 4%.The most common cause to treat was tendinopathy 59%, followed by muscle injury 11%, arthropathy 8%, tenosynovitis 7%, ligament injury 5%, stress fractures 5%, PEMS 4% and osteochondritis 1%

Results: From 375 patients, 350 complete their treatment. From those 278(78%) returned to their pre-injury training and daily activities. 68 patients (80%) from those who for first treatment respond perfect to the treatment while 220 patients (76%) from those who had another treatment before respond to the treatment. Minor Complications occur in 10% (35 cases).

Conclusion: Musculoskeletal injuries, sub acute and chronic, very often are difficult to treat. Many different treatments have been proposed such as Non Steroid Antiinflammatory Drugs, injections, physiotherapy, and massage. Our encouraging preliminary results of this prospective pilot study on Radial Shockwave Therapy for sub acute and chronic musculoskeletal injuries, seems to be a safe, non invasive and effective therapy, compared to other therapies. Further follow up of these patients is needed and further research using controlled and randomized studies.

Key words: Musculoskeletal injuries. Radial Shock Wave Therapy.

Flamenco dance injuries

Calvo JB¹, Cabral L²

¹Dpt. Of Anatomy University of Alcalá; ²Corpora Pilates-Clinica Sanart

Introduction: Like high level sports, the flamenco dancers are an excellent laboratory to study the impact on the floor and certain trunk and arm movements.

Material and Methods: 271 Flamenco dancers were studied: 126 professionals and 145 students. Mean of 18 hours of practice weekly. A questionnaire was distributed to determine demographic data, hours of dancing...etc. We obtained Footprints (calculating Chippaux Index) and the Range Of Motion of spine extension (cambrée) and ankle dorsiflexion (plié). Statistical analysis of data were made with SPSS Program. And ANOVA test was applied to determine the significative statistical differences.

Results: The 4 parts of the body most likely to be injured in Flamenco dancing are: 1. Feet; 2. Neck-shoulders (trapezius region specially); 3. Knee; 4. Lumbar spine. More frequent diagnosis: 1) Mialgies in the trapezius muscle; 2) Metatarsalgia; 3) Mechanical lumbalgia; 4) Patellar Compression Syndrome.

Factors Involved:

- Sudden increase of hours devoted to dancing is related to the appearance of lumbar, knee, foot and leg injuries.
- Spine Extension is a factor of injuries: the analysis of individual clinical cases let us to relate the lack of flexibility in the spine extensions to cervical injuries, and also the hyperextension of the trunk (specially the dorsal area) with an increase of dorsal pains.
- Years of practice are related with foot injuries.
- Between students, Foot, ankle, and leg injuries are related to bone stress: periostitis, scafoiditis, osteochondritis, ankle synovitis...
- Dancers with LEG and THIGH injuries have lower Chippaux Index than normal (similar to cavus foot).

Key words: Flamenco Dancing. Dance injuries.

Acute injuries in Olympic Fencing: Athens 2004 and Beijing 2008

Rodríguez Rey ER

Emergency Department, Hospital Universitario de Fuenlabrada (Madrid, Spain)

Introduction: Data was collected concerning injuries suffered by athletes competing in the Athens 2004 and Beijing 2008 Olympic Fencing events. The limited number of participants and competition pattern in Olympic Fencing enhances some of the known sport-specific injuries, while others vary. Some changes where observed in the injury statistics of the two subsequent Olympic Games. Injury-prevention measures are thus suggested.

Material and Methods: There are significant differences in the competition organization in World and Continental Championships and the Olympic Games. The first two are based on poule (group) elimination rounds of individual competition, with 5-6 bouts per fencer, to then go on to 128, 64 and 32 Direct Elimination bouts. In the Olympic Games, competition begins with Direct Elimination of 32, so the fencing is less and more intense.

International Fencing Federation (FIE) forms where used to collect information regarding injury number, date, gender, diagnosis and hospital transfer, when needed, during the Fencing events of the Athens 2004 and Beijing 2004 Olympic Games. The injured regions where divided into Head, Spine (SP), Upper Extremity (UE) and Lower Extremity (LE). The limited number of participants and direct elimination bouts in Olympic Fencing lessens the statistic significance of the data collected, but we find it adds information concerning injury type.

Results: In the Athens 2004 group, it was found that the total recorded injuries were 34, in the Beijing 2008 group they numbered 25, where it must be noted that in 2004 12 Olympic titles were at stake, a number reduced by the International Olympic Committee to 10 in 2008. The competing total of athletes in Beijing was 344 in the individual and team events, with a similar number per event in Athens, taking into account that 2 additional titles were at stake.

In the Athens 2004 group, the Head accounted 1 injury (ocular foreign body); the SP suffered 5 injuries, of which 4 were lower back pain; the UL suffered 11 injuries, of which 3 were elbow sprains and 3 others hand wounds; the LE suffered 17 injuries, of which 4 were knee sprains and 5 ankle sprains.

In the Beijing 2008 group, no injuries the Head nor SP were recorded; the UE suffered 25 injuries, of which 4 were contusions to the hand and 5 were cutting wounds to the hand; one shoulder dislocation on a previously injured athlete was recorded. The LE suffered 12 injuries, of which 6 were ankle sprains.

Conclusions: The known patterns of injury in high-level fencing competition vary in the Olympic Games because of the much shorter and intense competition. Lower back pain has diminished sharply, whereas the common ankle sprain still is the most frequent injury in Fencing. A sharp rise has been observed in the

percentage of wounds to the unprotected hand. It would be advisable to suggest protective measures to the ankle and hand, such as ankle strappings or supporting rods and gloving the unprotected hand.

Key words: Olympic Fencing. Trauma. Prevention.

The effectiveness of two different therapy modalities in the Enduro motorcyclist's wrist: a prospective random sample study

Sabeti-Aschraf M¹, Piebe K², Serek M¹, Geisler M¹, Arash A², Goll A, Hohenstein K, Crevenna R²

¹Vienna Medical School, Department for Orthopaedic Surgery;

²Vienna Medical School, Department for Rehabilitation and Physical Therapy

Introduction: Studies revealed that the wrist and the forearm are the predominantly overused body regions in competitive Enduro- motorcyclists. The transient flexor muscle compartment syndrome of the forearm and the Carpal tunnel syndrome were identified as the main diagnosis.

Material and Methods: This study represents the data of a prospective investigation, comprising a random sample of voluntary athletes. Enduro- motorcyclists were interrogated with a prepared questionnaire. Clinical examinations were performed immediately before, and after, a major Enduro- race, including pain assessment of the hand/ wrist and the forearm using the visual analogue scale. The occurrence of carpal tunnel syndrome and loss of grip strength in the forearm muscles were recorded in detail. As the race consisted of two runs on two following days at exactly the same race track, on day two, the population was randomized into two groups. Group one did not get any therapy. Group two reviewed local cryotherapy for the forearm and the application of vibration absorbers on the wrist. The effect was noted on the same questionnaire.

Results: Overall 84 athletes completed all four examinations and so took part in this investigation 46 athletes were analyzed in group one compared with 38 of group two. The increase of pain in the tested anatomical regions and the decrease of force were comparable with previous published data. Group two tended to have superior results but the analyses did not show a significant influence of the therapy.

Conclusion: Local cryotherapy and the used vibration absorbers did not improve significantly the athlete's performance, although the riders with therapy felt subjectively better. Although encouraging results were obtained significant effects were not observed. Never the less 71% of the treated athletes reported to have profited from the therapy.

Key words: Off-road. Motorcycle. Overuse injury. Cryotherapy.

DOPING-I

LANGUAGE: ENGLISH

Humoral effects of chronic cocaine abuse in sportsmen

Genili F¹, Bianco M¹, Bria S¹, Scardigno A¹, Palmieri V¹, Tonioni F², Lacerenza R², Mordente A³, Meucci E³, Silvestrini A³, Bria P², Zeppilli P¹

¹Sports Medicine Department, Catholic University, Rome; ²Institute of Psychiatry and Psychology, Catholic University, Rome;

³Institute of Biochemistry and Clinical Biochemistry, Catholic University, Rome.

Background: Cocaine is a sympathetic drug with well-known acute dangerous cardiovascular effects, but little is known on its chronic and subclinic effects. This study tries to bring novel insights on these topics, analyzing several biochemical parameters investigating liver, kidney, heart, muscle apparatuses, lipid profile and inflammatory condition.

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, and a peripheral venous blood test. Each blood sample was tested for the common biochemical parameters (glucose, ureic nitrogen, calcium, total and direct bilirubin, aspartate amino-transferase, alanine amino-transferase, creatin phosphokinase, lactic dehydrogenase, magnesium, inorganic phosphorous, total proteins, albumin, uric acid, total cholesterol, triglycerides, low-density and high-density lipoproteins,

pseudocholinesterase, gamma glutamyl transferase, lipase, alkaline phosphatase, iron, unsaturated iron binding capacity, sodium, potassium, chloride), for oxidative markers (nitrites and total antioxidant plasma capacity expressed as trolox equivalent antioxidant capacity) and, finally, for markers of acute (T troponin, TnT) and chronic (amino-terminal fragment of the brain natriuretic peptide pro-hormone, NT-pro-BNP) myocardial damage, were researched.

Results: CASES showed lower HDL-cholesterol levels than CONTROLS (45.5±11.3 vs 54.3±9.5 mg/dl, $p=0.021$) with a higher prevalence (even if not significant) of hypertriglyceridemia. Abnormally high values of creatine-phosphokinase, lactate dehydrogenase, transaminases, high-sensitivity C reactive protein, TnT, and NT-pro-BNP, were found only in some addicted sportsmen.

Conclusions: Chronic cocaine abuse in sportsmen is linked to a pro-atherogenic profile of plasma lipids; moreover, biochemical signs of "skeletal muscle damage" and markers of myocardial damage and inflammation can be found.

Key words: Doping. Muscle damage. Myocardial damage.

Nutritional supplements and medications in sport – polypharmacy or real need?

Suzic Jelena, Dikic Nenad, Radivojevic Nenad

Anti-Doping Agency of Serbia

Introduction: Expert panel of the Australian Institute of Sport (AIS) categorize nutritional supplements (NS) in four groups: group A - approved NS, group B - NS under consideration, group C - no clear proof of beneficial effects and group D - banned NS.

Objectives: The aim of our study was to describe qualitatively and quantitatively dietary supplements and medications used by elite athletes.

Methods: We analyzed data collected from Doping Control Forms from national, international competitions and out-of-competition done by Anti-Doping Agency of Serbia from 2005 - 2008. Athletes ($n = 618$; age 24.2 ± 5.8 yrs; 72% male) competing in various sports were asked about medications and supplements taken within 3 days before doping control.

Results: Among reported substances ($n = 1535$), 68.5% (1052) were NS and 29.6% (455) medications. NS have taken by 58% (2.87 per athlete) and medications by 39% of athletes (1.87 per athlete). Almost 18% of all users reported use of 6 or more different products and one athlete took 17 different products at the same time. Three most commonly used NS were multivitamins, multi-minerals and amino acids, respectively. In terms of AIS classification, majority of used NS was from group A (59.6%) and from group B, C and D, 4.6%, 35.1%, 0.8%, respectively. Majority of athletes who reported use of medication used NSAID ($n = 173$, 71.8%; 27.9% of all examined athletes). More than one NSAID was taken by 26% (45) users. In addition, more frequent use of NS among younger athletes was observed ($p < 0.05$).

Conclusion: Our study confirmed overuse of supplements and drugs by elite athletes. Fact that large number of athletes used supplements with no evident performance or health benefits, demonstrated the need for specific educational initiatives. Amount, quantity and combination of reported products raised concern about risk of potential side events.

Key words: Doping. Supplements. Drugs.

Doping in sport: attitudes and experience of medical doctors from Balkan region

Dikic Nenad, Suzic Jelena, Ionescu Anca, Dimitrova Diana, Natsis Kostas, Ergen Emin

Balkan Sport Medicine Association

Introduction: During the last two Olympic games, 5 athletes from the Balkan Countries lost medals and 4 athletes have been found to be doping positive out-of-competition, which included 44% of all positive cases in Sidney 2000, and 20% in Athens 2004.

Objectives: The aim of this study is to examine attitudes and experience of medical doctors from Balkan Countries.

Materials and methods: A total of 219 medical doctors from Bulgaria, Greece, Romania, Serbia and Turkey fulfilled the questionnaire related to doping control procedure, athletes' rights and responsibilities, their training in doping prevention and willingness to have more education.

Results: During the period of 12 months, 80% doctors have been asked for information about doping agents, 25% of the them have been contacted by athletes for the prescription of doping agents, 14% of doctors think that they should assist

athletes who want to use doping so that athletes can use doping safely and in 27% of the cases the doctors have treated athletes who are using doping due to medical problems. They believe that education is the most effective method for fight against doping and from the other side they believe that the least effective method is two years ban. They put adolescents and children as a first group which needs to be targeted in a doping prevention, as second professional athletes and third one amateur athletes.

Conclusion: Hypothesis that athletes are not informed because of poor knowledge of medical doctors is supported. Medical doctors from Balkan region are confused and controversial. They are aware that lack of information led to doping positive cases and they would like to be educated better. Therefore, it would be essential that medical doctors receive regular updates and be assessed on their knowledge of doping issues on the national level at least once per year.

Key words: Doping. Education. Medical doctors.

Knowledge evaluation about ergogenics and doping of polish disabled representatives for IWAS and Paralympics Games

Gawroński Wojciech

Sports Medicine Department, Academy of Physical Education, Kraków, Poland

Doping has intensified and penetrated to sports for disabled athletes. The goal of the conducted researches was to evaluate knowledge about ergogenics and doping of Polish Disabled Representatives for IWAS Games in Taipei 2007 and Paralympics Games in Beijing 2008. Observed group was consisted of athletes from four disciplines; power lifters, shooters, swimmers and athletics.

Athletes were asked in special prepared questionnaire about WADA antidoping code, prohibited substances, methods in sport and supplements used to improve sports abilities.

As a results were founded appropriate understanding of enhancing of sports performance as a "replenish variable deficiencies and fast recovery after physical efforts". On the other hand knowledge about doping was very weak. Observations show that usage of ergogenics aids should bring together with athletes education for choosing the effective and legal the specific sports ergogenics.

During preparation period to Paralympics Games in Beijing 2008 were organized for these groups lectures about doping and supplementation in sport. In the last two month before Paralympics were conducted individual talks with the same athletes which were researched one year ago about usage supplements or prohibited substances and methods.

Results indicated that athletes still were interested in using supplements to achieve optimal performance. Most of used substances are not enhance sport performance or recovery. In some cases were found that athletes were taken banned supplements (without knowledge about it) as Tribulus terrestris and others herbal testosterone supplements.

In conclusions was found that only providing continuously education to athletes and coaches about supplements and sport foods and their appropriate usage should be one of the most important goals in the fight against doping in sport for athletes with disabilities.

Key words: Doping. WADA antidoping code. Enhancing sports performance. Disabled athletes. Paralympic games.

Supraphysiological doses of anabolic steroids induce psychiatric side effects that correlate to abuse severity

Giannoulis K¹, Konstantinidis I¹, Toli P¹, Pagonis T¹, Karataglis D¹, Christodoulou A¹

¹1st Orthopaedic Clinic of Aristotle University of Thessaloniki, G.U.H.G.Papanikolaou, Thessaloniki, Greece; ²Medical University of Thessaly

Introduction: Anabolic steroids (AS) abuse induces a wide range of psychological side effects whose impact and emergence is dependent upon the severity of the abuse.

Methods: We studied a cohort of 320 Body-building, amateur and recreational athletes, of whom 160 were active users of AS (group C), 80 were users administering placebo drugs (group B) and 80 were not abusing any substance (Group A). Group C athletes were stratified according to AS abuse parameters, thus providing us with three subgroups of "light, medium and heavy abuse". Athletes of groups A

ORAL COMMUNICATIONS

and B were included in a "no abuse" subgroup. 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 thirteen months. Statistical analysis was performed by using the Kruskal-Wallis test for two groups and Linear regression analysis was used to ascertain the correlation between severity of use and escalation of side effects.

Results: At the end of the study, there was a statistically significant increase in all psychometric subscales recorded in group C, while the same values for group B and the control group (A) were without any statistically significant difference. D values for all subscales of SCL-90 and HDHQ showed a significant increase in the scorings of group C. Correlation of abuse, severity and side effects showed that there was a statistical significant increase in D values of all SCL-90 and HDHQ subscales that escalated as we moved from light abuse to medium and heavy abuse patterns.

Conclusions: The results of the study suggest that the wide range of psychiatric side effects induced by the use of AS is correlated to the severity of abuse and the force of these side effects intensifies as the abuse escalates.

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

EXERCISE PHYSIOLOGY-I

LANGUAGE: SPANISH

pH variations during recovery after the maximum physical effort test

Ramos Álvarez JJ, Del Castillo Campos MJ, Ramón Rey M, Segura Dorado JL, Bosch Martín A.

Centro de Medicina Deportiva. Comunidad Autónoma de Madrid

Introduction: The use of the metabolic substrates during the exercise involves extra and intracellular ionic variations which would induce pH changes triggering fatigue.

In the present work, we measure the pH, PO₂, and PCO₂ baseline, and during the recovery after a maximum physical effort test.

Material and methods: We studied 26 male soccer players category of child (Table I). Maximum stress test was performed on treadmill with incremental speed and constant slope protocol (2 km/h/2/1%) to reaching maximum cardiorespiratory criteria.

pH, PCO₂ y PO₂ measurements in capillary basal blood are conducted, and on the 1st and 3rd minute of the recovery stage.

Statistical study with ANOVA on a 95% significance level ($p \leq 0,05$)

Results: In Table 2 lists the results obtained of the variables we studied.

We found statistically significant differences in the pH during the recovery with respect to the basal ($p < 0,05$), with no difference between minutes 1 and 3 of the recovery stage ($p > 0,05$).

During recovery, while PCO₂ decreased, PO₂ significantly increased ($p < 0,05$).

The maximum average oxygen intake was 59,13 +/- 5,23 ml/kg/mn

Conclusions: During recovery hyperventilation (RQ >1,1) justifies the PCO₂ drop and the PO₂ increase. However, the capillary pH remains acid in relation to the basal one.

The pH measurements could be useful to assess the recovery times when planning loads on intermittent sports.

Key words: pH. Recovery. Exercise testing.

Table 1. Ramos Álvarez JJ, et al

Age in years	Weight in kg (percentile)	Height in cm (percentile)
13,74 +/- 0,9	53,8 +/- 9,6 (P ₅₀)	165 +/- 10,2 (P ₆₅)

Table 2. Ramos Álvarez JJ, et al

	pH	PCO ₂ mmHg	PO ₂ mmHg
Basal	7,38 +/- 0,07	38,14 +/- 11,8	82,41 +/- 16,57
1min recovery	7,27 +/- 0,06	30,55 +/- 6,12	96,68 +/- 23,55
3min recovery	7,28 +/- 0,08	30,70 +/- 8,59	93,55 +/- 13,16

Maximal heart rate behavior in athletes and sedentary subjects at 2640 meters above sea level

Galeano E¹, Agudelo B²

¹Physiology lab, High Performance Centre Coldeportes Bogota Colombia; ²El Bosque University, Sports Medicine graduate Program Bogotá Colombia

Introduction: Prediction equations for maximal heart rate have been used worldwide for many years; however, their scientific background has been questioned, and none of them had been proposed based on measurements made at intermediate altitude conditions such as 2640mts above sea level.

Objective: To analyze the behavior of maximal heart rate (MHR) in athletes and sedentary healthy subjects comparing between the Cardiopulmonary Exercise Test (CPET) results and those expected using Astrand, Inbar and Tanaka's equations, proposing a new equation under these conditions.

Methods and materials: 3021 Cardiopulmonary Exercise Tests (CPET) of athletes and sedentary subjects conducted at the High Performance Centre in Bogota between the years 1997 and 2007 were taking, verifying the maximal test criteria for each test: respiratory quotient, breath frequency and rate of perceived exertion.

Analyzing the MHR obtained in the CPET with that obtained using the Astrand (220 - age), Inbar (205.8 - (0.685 * age)) and Tanaka (208 - (0.7 * age)) equations, a linear regression was done to propose a new equation.

Results: Even though elevated values of Heart rate were expected due to the effect of the hypobaric hypoxia, the average MHR for all CPET was significantly lower ($p < 0,005$) than that expected for Astrand, Inbar and Tanaka values no matter age, physical activity level or gender. A new equation model is proposed including age MHR = 199 -(0,60*Age), and another one including age and bodyweight MHR = 204 -(0,10*Weight)-(0,56*Age), both models showed significant statistical relationship between variables with confidence level of 99%.

Conclusions: At Bogota's altitude (2640mts above sea level), MHR values for athletes and sedentary people were significantly lower than values obtained from conventional equations, and a new equation including age and bodyweight fits better to describe the behavior of MHR under these conditions. Figure 1.

Key words: Cardiopulmonary Exercise Test (CPET). Maximal Heart Rate (MHR). Intermediate altitude.

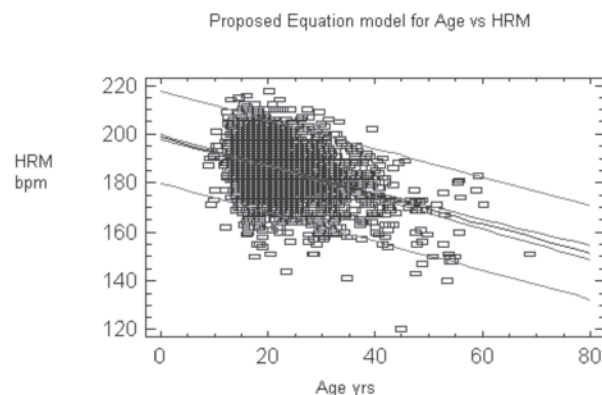


Figure 1. Galeano E, et al.

Oxidative stress, muscle damage and leucocyte counts in runners completing a standard marathon

Aierdi A¹, Ruiz F¹, Barrera J², Gravina L¹, Benito C³, Gil SM⁴, Irazusta J¹

¹Department of Physiology, Faculty of Medicine and Dentistry, University of the Basque Country; ²Department of Physical Medicine and Rehabilitation, Hospital Donostia, Osakidetza; ³Gabinete Análisis Clínicos de Donostia-San Sebastián; ⁴Department of Physical Education and Sport, Faculty of Physical Activity and Sports Science, University of the Basque Country

Introduction: Biochemical markers of cell damage, oxidative stress and white blood cell count are modified after a competitive marathon. These parameters

seem to be related among them. However, the exact nature of this interaction is not known. The aim of this study was to analyse the effect of a competitive marathon on the plasma levels of muscle damage markers, oxidative stress related parameters and the white blood cell count.

Methods: 14 male participants of the San Sebastian Marathon 2007 took part in this study (45,9±8.9 year old; time in marathon 3,11±0,31h). Blood samples were obtained 24h before, immediately and 18 h after the race. Plasma levels of total antioxidant status (TAS), superoxide dismutase (SOD), glutathione reductase (GR) were measured with a “Shimadzu 540” Spectrophotometer”. Creatine kinase (CK), aspartate aminotransferase (AST), alanine aminotransferase, γ -glutamyl transpeptidase (GGT), lactate dehydrogenase (LDH) and cortisol were measured by a “Cobas Integra 400 plus” system. Haematological parameters were evaluated by a “SYSMEX XT-200i” analyzer. ANOVA and Scheffé post-hoc test were used for the statistical analysis. Also, Pearson’s R was calculated to evaluate the correlation between the different parameters.

Results: Serum activity of enzymes related to muscle damage and cortisol were increased after the race. The increase of LDH and cortisol occurred immediately after and the increase in CK and AST, 18h after the race. TAS was decreased immediately and 18 hours after the marathon. The number and percentage of neutrophils increased after the race. However, there were less lymphocytes, monocytes and eosinophils in the blood after the competition.

TAS and GR activity were negatively correlated to the percentage of neutrophils 18 hours after the race. GR activity was positively related to CK and LDH activity 18h after the race.

Conclusions: A competitive marathon increases oxidative stress, it causes muscle damage and it alters white blood cell count. These changes may be modulated by the antioxidant status of the plasma.

Key words: Marathon. Oxidative stress. Muscle damage.

Lactate vs pedalling in BMX cycling discipline

Mateo March M^{1,2}, Blasco Lafarga C^{3,4}, Zabala Díaz M^{1,5}, Guzmán Luján J.F³, Velarde Ganivet S^{1,5}, Simón Castro A², Oviedo Durá A².

¹Spanish Cycling Federation, Madrid, Spain; ²Valencian Cycling Federation, Spain; ³Faculty of Sport, University of Valencia, Spain; ⁴Valencian Council of sport; ⁵Department of Physical Education and Sport, University of Granada, Granada, Spain.

Introduction: Traditionally, BMX is considered an Anaerobic Power and cyclic sport (mean time in Official Championships: 34.66±2.39 s). However, this discipline has important technical requirements of skill and strength that disrupt and diminish the pedalling, and moreover, the few BMX published papers reflect low concentrations of lactate (8.55 ± 3.74 mMol/l). This study aims to deepen on the BMX lactate values, its meaning and its possible relationship with the skills used in competition.

Materials and methods: An experimental design was carried out with two intra-subject variables; the first was the type of track, with three items: 1) high difficulty, 2) medium difficulty and 3) low difficulty. The second one was the technical determining factor (pedalling, Figure 1), with three items: 1) Non-pedalling race, 2) pedalling only on the Gate Start, and 3) competition pedalling. 10 athletes, 8 men and 2 women from the Spanish Junior Team, made 9 races, three on each circuit and on each technical condition; next to an anthropometry. Blood lactate was measured after each test.

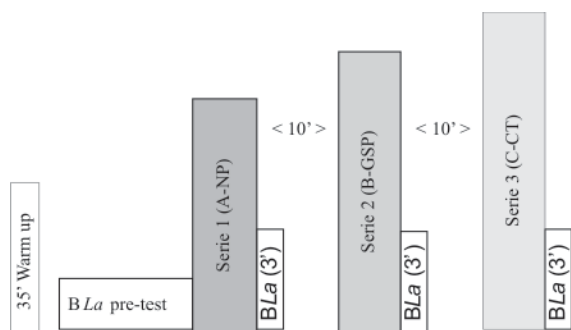


Figure 1. Mateo March MT, et al. Three series of the BMX Test: outline of measurements

Results: The results on the Analysis of Variance for repeated measures showed no statistical differences according to the greater or lower possibility of pedalling, while we found the maximum significance according to the track ($p < .001$); therefore, regarding to the technical difficulty lactate levels were significantly higher as technical difficulty decreased. This significance is kept when analysing the interaction pedalling*track ($p = .025$).

Conclusions: The highest the technical difficulty, the lowest the lactate concentration; while in the less technical tracks pedalling becomes more significant in performance, resulting lactates significantly higher. The data support the hypothesis that the BMX has components of skill and force that become more determinant when increasing the technical level (most difficult tracks), making it necessary to complete the performance assessment with other more neuromuscular variables.

Key words: BMX. Lactate. Pedalling. Performance.

Table 1. Mateo March MT, et al. Statistical descriptives: mean and standard deviation for BLaMM (blood lactate related to muscle mass; left side of the table) and BLA (blood lactate absolute values, on the right side)

N= 10	Avg. (NP)	Avg. (GSP)	Avg. (CT)	Avg. BLa	Avg. BLa	Avg. BLa
(8 m y 2 w)	BLaMM	BLaMM	BLaMM	(NP)	(GSP)	(CT)
Track 1	0,217	0,268	0,302	7,9	9,670	11,010
SD	±0,081	±0,106	±0,103	±1,6	±1,64	±1,65
Track 2	0,215	0,255	0,317	7,830	9,2	11,53
SD	±0,079	±0,110	±0,116	±1,8	±2,16	±2,56
Track 3	0,180	0,218	0,326	6,62	7,98	11,89
SD	±0,055	±0,069	±0,108	±1,18	±1,21	±1,59

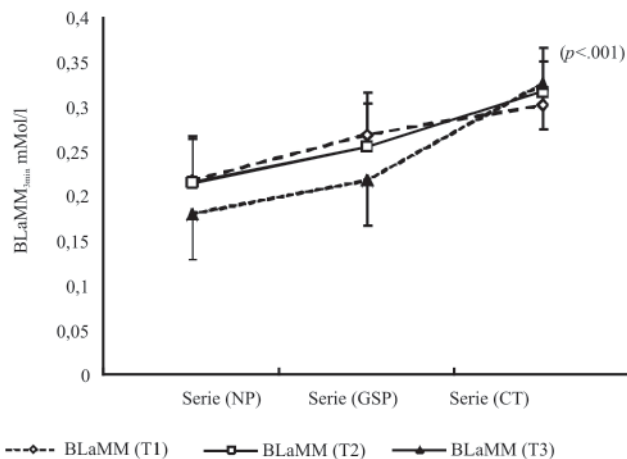


Figure 2. Mateo March MT, et al. BLaMM_{min} mean values for the three pedalling possibilities (technical determining factor) in the 3 different tracks

VO_{2max} and time to exhaustion responses with different exercise modes in triathletes

Viana-Montaner BH¹, Gómez-Puerto JR¹, Da Silva-Grigoletto ME¹, Centeno-Prada R¹, Beas-Jiménez JD¹, Melero-Romero C¹.

¹Andalusian Center of Sports Medicine, Córdoba, Spain

Introduction: Some surveys compare VO₂ performance during ergometric tests between different exercise modes (cycling and running), although only few of them are carried out on individuals skilled in both exercise modes. Research done is even less significant as regards Time to Exhaustion Tests (TTE) at rates reaching VO_{2max} (IVO_{2max}). However, as far as we know, up to now no incremental tests together with constant workrate tests have been carried out during the same session.

Thus, this survey aims at analysing whether the kind of exercise performed by triathletes may have an influence on VO_{2max} got by the incremental test, and on

ORAL COMMUNICATIONS

the TTE assessed in a constant workrate test at IVO_{2max} , both been assessed and compared during the same session.

Material and methods: 16 male triathletes (age: 29.5 ± 8.4 , years; weight: 71.7 ± 4.3 , kg; height: 174.8 ± 5.6 cm.) have carried out a max incremental test so as to reach VO_{2max} and IVO_{2max} , and after 30 minute recovery time, they went through a constant workrate test at IVO_{2max} , so as to get the TTE. These tests were carried out at random on cycloergometer and on mat in two different days over a washing period between them of around 4 to 7 days.

Results: Significant differences were found ($p < 0.001$) between the VO_{2max} got on the cycloergometer ($61.7 \pm \dots$ ml/kg/min) and on the mat ($65.6 \pm$ ml/kg/min). Besides, on the TTE, there were no significant differences ($p = 0.80$), between the cycloergometer and the mat (222 ± 59.5 s vs. 238 ± 59.5 s, respectively)

Conclusions: In triathletes, the kind of exercise has an influence on the VO_{2max} got through an incremental test, while it seems not to influence the TTE, at least when the constant workrate test is not carried out during the same session as the incremental test.

Key words: VO_{2max} . Cycloergometer. Triathletes.

EXERCISE PHYSIOLOGY-I LANGUAGE: ENGLISH

Adventure racing: energetic metabolism, physiologic stress – reported case

Bassan JC¹, Bianchini LF¹, Urbinati SK^{1,3}, Wassmansdorf R¹, Ferreira MAS², Modesto FJ¹.

¹Laboratório de Bioquímica e Fisiologia Aplicada ao Movimento Humano. Faculdade Dom Bosco. Curitiba. Pr. Brasil; ²CEPPE. Centro de Estudos em Psicologia Desportiva, São Paulo, SP Brasil; ³CEFID. Universidade do Estado de Santa Catarina. Florianópolis, SC, Brasil

The adventure racing is a kind of running that unites many sports, as the mountain bike, trekking, leading, canoeing, and may take from 6 hrs up to 10 days. The actual experiment had as a goal, to verify the energetic metabolism and physiological stress during a running adventure race test. We had 02 male athletes of national level competitors, averaged age ($31,71 \pm 10,90$) year, body mass ($73,65 \pm 1,63$) Kg, high ($1,79 \pm 0,06$) cm, fat percentage ($10,40 \pm 2,14$) and VO_{2max} ($66,97 \pm 1,88$) ml/kg/min⁻¹. These athletes were evaluated in two different moments. At first, 15 days prior competition (body composition and cardio respiratory aptitude were analysed). And second, on the day of the test, lactate, glucose, triglycerides, creatine kinase (CPK) and cortisol were collected prior and post competition. The Jackson's and Pollock's equation were used to analyse the %G (1983) and Mader's test of aerobic power. For the blood analysis the enzymatic UV by Lactate Desidrogenase was used (LDH)/Selectra 2 for lactate, enzymatic colormetric/Selectra 2 for glucose, GPO-PAD Selectra 2 for triglycerids, enzymatic optimized UV/Selectra 2 for CPK and method quimioluminescency for cortisol. The data was presented as descriptive statistics (average and DP). The time taken for testing the athletes was approximately of 12 horas, the following results were found; athlete 01 presented lactate (previous=18,6 mg/dL post S/D), glucose (previous=79; post= 112 mg/dL), triglycerides (previous=228; post= 122 mg/dL), CPK (previous=137; post =162 u/L), cortisol (previous=20,8; post= 17,6 microg/dL). The athlete 02 presented lactate (previous=20,1; post 41 mg/dL), glucose (previous=64; post= 63 mg/dL), triglycerides (previous=104; post= 77 mg/d/L), CPK (previous=91; post= 87 u/L), cortisol (previous=15,3; post=18,5 microg/dL). Considering the energetic demand and level of the effort taken during the adventure racing, we have verified that although there is a high volume in the test, there are no indications of inflammatory injuries (observing CPK) and an adequate cardio respiratory condition. Has to be mentioned that the capacity or leading during the test may alter performances as well as the physiological stress.

Key words: Adventure running racing. Energetic metabolism. Physiological stress.

Relationship between serum ferritin and markers of cellular damage in ultraendurance and endurance exercise

Õopik V^{1,2}, Unt E^{1,2,3}, Karelson K^{1,2}, Vaher I^{1,2}

¹Institute of Exercise Biology and Physiotherapy, University of Tartu, Tartu, Estonia; ²Estonian Centre of Behavioural and Health

Sciences, University of Tartu, Tartu, Estonia; ³Sports Medicine and Rehabilitation Clinic, Tartu University Hospital, Tartu, Estonia.

Introduction: Serum ferritin level is correlated with the total amount of iron stored in the body. However, an increase in serum ferritin may be caused by cellular damage in skeletal muscle induced by strenuous exercise. Such damage could be evaluated on the basis of an increase in the activities of creatine kinase (CK) and lactate dehydrogenase (LDH) in serum. Therefore, the main goal of the present study was to assess the relationship between changes in serum ferritin concentration and serum CK and LDH activities in endurance exercise.

Methods: Eight male army cadets (25.5 ± 3.0 yrs, 75.4 ± 9.7 kg, 180.1 ± 5.6 cm, VO_{2max} /kg: 64.5 ± 8.1 ml/min/kg) were examined during an international military combat competition (CC) of 3.5 days' duration (approximate total distance 135 km). Blood samples were taken pre-competition (PRE), post-competition (POST) and 24 h POST. Sixteen trained male subjects (27.0 ± 4.7 yrs, 77.6 ± 9.6 kg, 180.6 ± 6.3 cm, VO_{2max} /kg: 66.2 ± 5.7 ml/min/kg) were studied during 40 km ski marathon (SM). Blood samples were taken PRE, POST, 18 h POST, and 66 h POST. In both occasions serum was analysed for the concentration of ferritin as well as for the activity of CK and LDH.

Results: Serum ferritin level increased significantly in the cadets as a result of completion of the CC (60.9 ± 15.0 ng/ml vs 105.8 ± 30.7 ng/ml, $p < 0.05$, in PRE and POST, respectively) and remained elevated for the next 24 hours (24 h POST 112.0 ± 41.0 ng/ml, $p < 0.05$). There was no effect of exercise on serum ferritin level in the subjects who completed the SM: their PRE, POST 18 h POST and 66 h POST values were 57.2 ± 32.0 , 59.5 ± 36.5 , 61.1 ± 31.8 , and 58.7 ± 34.5 ng/ml, respectively. The activity of CK as well as LDH in serum was significantly elevated during POST in both groups. The activity of CK measured PRE and POST in CC and SM were 154.8 ± 57.6 and 1328.3 ± 93.4 U/L ($p < 0.05$); and 186.5 ± 110.0 and 298.6 ± 118.9 U/L ($p < 0.05$), respectively. Corresponding values of LDH activity were 408.6 ± 65.3 and 741.8 ± 98.6 ($p < 0.05$) in CC and 332.2 ± 48.1 and 483.6 ± 75.1 ($p < 0.05$) in SM. In CC and SM the activities of both enzymes in serum remained significantly elevated 24 h POST and 18 h POST, respectively. A significant correlation ($r = 0.72$, $p < 0.05$) was observed between serum ferritin level and LDH activity in POST in CC.

Conclusion: The results suggest that an extensive increase in serum CK and LDH activities after strenuous endurance exercise (1.8 – 8.6 times above pre-exercise level) is accompanied by a significant elevation in serum ferritin concentration. In case of less pronounced increase in serum enzyme activities (1.5 – 2.3 times above pre-exercise level) the concentration of ferritin remains unchanged.

Key words: Military combat competition. Ski marathon. Blood biochemistry.

Diurnal fluctuations in factors affecting cycling performance

Sesboüé B¹, Moussay S², Bessot N², Gauthier A², Davenne D²

¹Institut Régional de Médecine du Sport, CHU CAEN, France; ²UFR-STAPS, Université de CAEN Basse-Normandie, CAEN, France

The time of day is a factor of major influence on the conditions for carrying out an exercise. Indeed, the majority of motor performances involving a level of physical commitment are optimized in the late afternoon (Baxter and Reilly, 1983). Within our research team, cycling activity has regularly been the subject of studies to quantify the diurnal variations in athletic performance and to identify the origins (Moussay, *et al.* 2002a; Moussay, *et al.*, 2002b; Moussay, *et al.*, 2003; Bessot, *et al.* 2006a; Bessot *et al.* 2006b). The objective of this work is to synthesize the results of the work dealing with the diurnal influence on cardio-respiratory factors involved in cycling performance.

Different exercise situations have been put in place to explore the diurnal fluctuations in (i) the maximum power of aerobic metabolism, (ii) the oxygen consumption associated with a determined level of sub-maximal exercise, or (iii) the maximum endurance of aerobic metabolism. The results obtained during the different studies fail to highlight change in daily maximum values of physiological parameters during conditions of maximum aerobic exercise. Thus, the diurnal variations in performance reported in the literature (Baxter and Reilly, 1983) cannot be attributed to changes in the power of aerobic metabolism. In contrast, the maximum aerobic endurance assessed using a test of time keeping up with a workload seems to be a major explanatory factor for these variations in performance. The origin of this change in daily maximum aerobic endurance is the result of greater participation of anaerobic metabolism in the late after-

noon, without ruling out a possible effect of the circadian fluctuations in body temperature.

Moreover, given changes in the functioning of the musculoskeletal system induced by the circadian rhythmicity of body temperature, impaired muscular coordination and more generally of sporting gesture should be considered at certain times of the day (Moussay, *et al.* 2003; Bessot, *et al.* 2007).^j

Key words: Sports. Cycling performance. Circadian rhythm.

Intermittent hypobaric hypoxia exposure enhances running economy in untrained rats

Pagès T, Marin J, Esteva S, Torrella JR, Viscor G.

Department de Fisiologia - Biologia. Universitat de Barcelona. Barcelona (Spain)

Previous studies have demonstrated that intermittent hypobaric hypoxia (IHH) exposure in rats affects some skeletal muscle morphofunctional parameters as capillary density, oxidative character and fibre type composition. The main goal of this study was to verify if those changes can elicit some enhancement in aerobic exercise capacity.

25 male rats were randomly divided in 2 groups: Control (n=12) maintained at sea level and Acclimated (n=13) exposed to an IHH program (5000m simulated altitude at Pb=54 KPa for 4 hours/day, 5 days/week along 22 days).

Rats were previously habituated to exercise in a treadmill, but were not submitted to a training program. An incremental maximal test was performed at the beginning (Pre), at the end (Post), and ten (10dPost) and twenty (20Post) days after the end of the IHH program in both control and hypoxic groups. These were performed in a metabolic treadmill (initial speed 16cm/s and tilt 15°). Slope was constant along the test but speed was increased in 2 cm/s every 2 minutes until exhaustion of the animal. VO₂ was monitored (Oxylet 4, Leticia Scientific Instruments) during exercise test and recovery.

No significant differences were found in VO₂max between acclimated and control animals. However, a lower VO₂ for a same workload was observed (17-27%), with a significant right shift in the VO₂/workload curve in acclimated animals as compared to control. Moreover, exercise time significantly increased in Post (11.20%), Post 10d (22.10%) y Post 20d (15.20%), whereas no changes were observed in control animals. However, recovery time, as indicated by VO₂ recording, only significantly decreased (about 6 minutes) in Post 10d. These data can be interpreted as a clear increase in the running efficiency of the animals submitted to simulated altitude intermittent exposure.

Further studies must be developed to confirm our hypothesis and to reveal the subjacent mechanisms of these physiological adjustments. On the other hand, it is also necessary to test the combination of two stressing factors to skeletal muscle oxygen delivery: exercise training and hypobaric hypoxia.

Key words: Intermittent hypobaric hypoxia. Running economy. Rats.

The effects of combined training (endurance – resistance) on lipid profile in men aged between 35 and 45

Sepiani B¹, Fallah Mohamadi Z¹, Kargarfard M²

¹University of Mazandaran; ²University of Isfahan

Introduction: The purpose of this study was to determine the effects of combined training (endurance and resistance training) on blood lipid levels (high-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol [LDL-C], and lipoprotein (a) [Lp(a)], in the male aged between 35 and 45 year.

Method: In a Cross-sectional study, 24 sedentary males were randomly allocated to experimental (N=12, Mean±SD; age 38 3.76 year) and control (N=12, Mean±SD; age 41±4.86 year) groups. The training program consisted of an 8 week training period, three sessions a week, each lasting 45 minutes at an intensity producing (50- 75%) of Vo₂max and consumption 1000-1100 (kcal/ wk). Age, body composition (height, weight, body mass index, seven skinfold thickness), blood lipid levels (High-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol [LDL-C], and hemodynamic measurements (heart rate at rest and during exercise and predicted VO₂max).

Results: The results of this study showed that the exercise training programme had no significant different on HDL-C (HDL-C: Pre 35.62±5.97, Post: 37.37±5.95 mg /dl,(P = 0.34) for both control and experimental groups. But on Lp (a) and LDL-C [LDL-C: Pre 101±20.40, Post: 97±13.01 mg /dl, (P= 0.015) and Lp(a): Pre 38.5±37.24, Post: 27.25±33.28mg/dl,(P=0.045)] differed significantly for both control and experimental groups.

Conclusions: According to the results of this research, this study revealed that combination resistance with endurance training can be useful for decreasing cardiovascular risk factor [Lp(a)]. In addition, this training programme increases useful lipoprotein HDL-C and decreased the cardiovascular risk factor, Lp(a). This training programme probably plays a dominant role in control and prevention of cardiovascular disease.

Key words: Combined training. HDL-C. LDL-C. Lp(a).

EXERCISE PHYSIOLOGY-II

LANGUAGE: ENGLISH

Effects of single dose arginine supplementation on lactate threshold and performance

Yavuz HU¹, Demirel AH², Turnagöl H², Sahin Z²

¹Near East University, Department of Physical Education and Sport; ²Hacettepe University, Department of Sport Sciences and Technologies

This study has been designed to investigate the possible effects of pre-exercise acute arginine supplementation on lactate threshold and lactate metabolism in male wrestlers. Nine volunteer male wrestlers who were wrestling in Turkish Greco-roman 1.st league participated to the study. Test- retest protocol was done on the same subjects. After 12 hours fasting (during the night) venous blood samples were taken before the exercise protocol for determining the plasma amino acid profiles and arginine levels. Incremental exercise protocol was applied and oxygen consumption was measured during the exercise, heart rate and plasma lactate levels were measured during the exercise and recovery. Exercise protocol started at 90 watts on bicycle ergometry and the load was increased 30 watts in every 3 minutes. Exercise was continued till the subjects can not go on cycling at the desired working loads or the subjects wanted to stop. Plasma amino acid profiles were also determined after the exercise protocol. Study has been conducted by using cross over design. Half of the subject took 1.5 gram /10 kg body weight L-arginine while other half were taking same amount of wheat bran before the first exercise and same amount of L-arginine before the second exercise protocol. Results showed that in the same working loads there was no difference for the mean lactate levels between arginine and placebo groups (p>0.05) while there was a right shift on working load-lactate graphic. There was no difference for maximum oxygen consumption (arginine 52.47±4.01, placebo 52.07±5.21) and maximum heart rates (arginine 181.09±13.57, placebo 185.89±7.38) (p>0.05). Time to exhaustion was longer with L-arginine supplementation (1386.8±69.8 sec) compare to placebo (1313±90.8 sec). Plasma arginine, ornithine and citrulline levels before and after the exercise were found higher with L-arginine supplementation. These results suggest that L-arginine supplementation can have beneficial effects on exercise performance but can not explain the metabolic pathways which are responsible from these effects.

Key words: Arginine. Lactate. Incremental exercise. Plasma amino acid profile.

Effects of different exercise program on blood markers of oxidative stress in young women

Radovanovic D¹, Vukovic J², Ignjatovic A³, Veselinovic N¹, Dondur S¹.

¹Faculty of Sport and Physical Education, University of Nis, Serbia; ²Public Health Center Sabac, Serbia; ³Faculty of Pedagogy Jagodina, University of Kragujevac, Serbia

Introduction: Increased aerobic metabolism during exercise is a potential source of oxidative stress. Only a few studies have investigated and compared different aerobic exercise programs and their relations to pro-oxidant and antioxidant activities.

Aim: The aim of this study was to compare biomarkers of oxidative stress: lipid peroxidation, protein oxidation and total antioxidants in blood, as well as functional variables, before and after 12 weeks of two different exercise programs.

Methods: Blood samples were collected from seven young women who performed pilates training as low-intensity aerobic exercise and from seven young women who performed taekwondo training as high-intensity aerobic exercise. Samples were analyzed for lipid peroxidation byproduct malondialdehyde, enzyme catalase, reactive carbonyl derivatives, total sulfhydryl groups and serum antioxidant

status. The results were statistically evaluated by the by the Wilcoxon Signed Ranks Test and Mann-Whitney U Test.

Results: There were no significant differences in any functional or biomarkers parameters between groups before training program at beginning of study. After 12 weeks catalase increased in both group but increase was significantly higher with pilates training, whereas serum antioxidant status increased significantly higher with taе-bo training. Both training programs increased values of malondialdehyde, protein carbonyls and sulphhydryls, but there were no significant differences between groups.

Conclusion: There was evidence of oxidative stress after both pilates and taе-bo training program. Biomarkers of oxidative stress in blood increased after both 12 weeks training program. Due to different metabolic demands of pilates and taе-bo training, we can conclude that both training types induced oxidative stress and action effects of O₂ is not only mechanism for exercise-induced oxidative stress.

Key words: Oxidative stress. Pilates. Taе-bo. Exercise.

Effect of relatively high intensity exercise training on myocardial β -adrenergic responsiveness and calcium signalling in diabetic rats

Lahaye Le Douairon S¹, Malardé L¹, Zguira S¹, Vincent S¹, Lemoine Morel S¹, Zouhal H¹, Carré F², Rannou Bekono F¹

¹Laboratory Mouvement Sport Santé, UFR APS, University of Rennes 2, Rennes, France; ²Laboratory of Medical Physiology, University of Rennes 1, Rennes, France

Introduction: Impaired contractile responsiveness to β -adrenergic stimulation induced by diabetes are likely to result from alterations in the Ca²⁺ regulatory proteins. This study determined whether exercise training could modify myocardial performance by preventing the alterations in Ca²⁺ cycling proteins observed in the diabetic rat heart.

Methods: Streptozotocine-induced diabetic rats (STZ, 45 mg/kg, iv) were placed into a high intensity endurance treadmill running (TD; 25 m/min, 60 min/d, 5 d/wk, 8 weeks) or sedentary group (SD). Age-matched rats were sedentary (SC) or trained (TC) controls.

Abundance of Ca²⁺ regulatory proteins was assessed using Western blots. Left ventricular (LV) performance with and without β -adrenergic stimulation were determined in isolated perfused working hearts.

Results: Diabetes elicited any significant effect on Ca²⁺ regulatory proteins abundance. However, RyR2, SERCA2, PLB and NCX1 abundance were increased with training in diabetic rats ($p < 0.05$). Despite similar LV developed pressure, baseline HR and \pm dP/dt were significantly lower in diabetics compared with controls ($p < 0.05$). Training elicited any effect in those myocardial parameters. A significant increase in \pm dP/dt occurred in TC with the administration of 1.10^{-8} M of isoproterenol ($p < 0.001$). This significant increase was shifted rightward 10-fold in SC and SD ($p < 0.05$) and 100-fold in TD ($p < 0.01$). \pm dP/dt peak responses for controls were obtained at 1.10^{-7} M isoproterenol infusion whereas for diabetics, they were shift rightward and obtained at 1.10^{-6} M.

Conclusions: High intensity endurance training in diabetes increases the abundance of key Ca²⁺ cycling proteins without improving contractile parameters. A reduced β -adrenergic myocardial sensitivity, yet accentuated by training, in diabetes may be responsible for the opposite training effects. It seems that training protocol was so severe for diabetic rats. Thus, it appears that an inadequate training protocol for diabetic population can have a negative impact on cardiac function.

Key words: Diabetes mellitus. Exercise training. Ca²⁺ cycling proteins.

Comparison of VO_{2max} between three submaximum protocols in women between the ages of 40 and 65

Marins J, Dramboz C, Marins N, Oliveira C, Moreira O.

Universidade Federal de Viçosa – LAPEH – Minas Gerais – Brasil

Introduction: An evaluation of the aerobic capacity of individuals who practice physical exercise is basic in helping in the preparation of the training, as well as parameters of control of its effect over time, the submaximum tests being a simple and safe alternative in determining the VO_{2max}.

Objective: To compare methodological actions of the VO_{2max} evaluation protocols with the submaximum demand in cycloergometry (Astrand and Ryhming; YMCA) and the 1600 meter walking test, in order to check which is most appropriate for apparently healthy women.

Methodology: 50 voluntary women with an average age of 51.24 ± 6.3 participated; BMI 25 ± 3.51 kg/m²; Percentage of fat $31.92 \pm 4.63\%$, apparently healthy and regularly practicing physical activity. They all were subjected to three protocols of evaluation two being cycloergometry (Astrand and Ryhming; YMCA) while the third being a 1600 meter walking test, all of the submaximum profile. Those evaluated were monitored continuously by the Polar system in order to observe the cardiac response during each test. The statistical test employed to compare the results of VO_{2max} was ANOVA associated to the Tukey test, with a signification level of $P < 0.05$.

Results: Table 1 presents the results obtained in the different tests, where significant differences were not noticed between the tests for the VO_{2max} calculation. Those evaluated adapted completely to the submaximum test of Astrand y Ryhming, besides the 1600 meter walking test, in such a way that they all ended the tests. On the other hand, the YMCA protocol presented serious difficulties to those evaluated, keeping in mind that 30 did not manage to complete the majority of the test due to peripheric fatigue. This factor can be caused by the characteristic of imposing a progressive load during the test.

Table 1. Marins J, et al. VO_{2max} between different submaximum protocols in women

	Astrand y Ryhming	YMCA	1600 meters	P
VO ₂ ml (kg.min) ⁻¹	32.91 \pm 8.37 (49.6 – 10.9)	30.19 \pm 5.75 (45.15 – 25.37)	31.41 \pm 5.55 (46.39 – 20.73)	> 0.05
VO ₂ l.min ⁻¹	2.01	1.97	1.93	

Average, \pm Divergent standard (maximum and minimum)

Conclusion: The tests did not differentiate between themselves in estimating the VO_{2max}, nevertheless, cycloergometry does not seem to be the best indicated test for the evaluated group due to the elevated rate of giving up during the protocol, signaling that the pre-established loads are not appropriate for a group of active women between 40 and 65 years old.

Thanks: FAPEMIG

Key words: VO_{2max}. Submaximum Protocol. Woman. Physical Evaluation.

EXERCISE PHYSIOLOGY-III

LANGUAGE: ENGLISH

Aerobic capacity and heart rate variability in athletes

Zupet P¹, Finderle Z²

¹Sports Medicine Unit, University Medical Center Ljubljana, Slovenia; ²Institute of physiology, Faculty of Medicine, Ljubljana, Slovenia

While resting, athletes have a lower heart rate (HR) than untrained persons, whereas researchers do not share the opinion concerning the connection between the aerobic capacity and the variables of the heart rate variability (HRV).

The aim of this study was to assess the correlation between maximal aerobic capacity and HRV indices in young male athletes. The study used a cross-sectional comparison of 27 top-level athletes (aged 17.3 ± 0.8 , range 16–18 years; body height 177.1 ± 7.3 , range 164 to 190 cm). None of them took any drugs. The maximal oxygen consumption (VO_{2max}) was measured during an incremental continuous test on a treadmill ergometer. The criteria for the achievement of VO_{2max} were the absence of a further increase in VO₂ despite the increasing load, RQ > 1.1 or subjective exhaustion. Body weight was used for the calculation of relative VO_{2max} (ml/min/kg). Prior to the load test, a 10-minute ECG recording was obtained while each individual was resting in the supine position. The standard deviation of the heart rate (SDNN) and the proportion of interval differences of successive NN intervals greater than 50 ms (pNN50) were assessed through time domain method and total power (TP) through frequency domain method of HRV analysis.

VO_{2max} measured from our athletes ranged from 48,7 ml/kgmin to 75,3 ml/kgmin. We found a significant relationship between maximal aerobic capacity and a parameter which estimates high frequency variation in heart rate (pNN50: $r=0,435$, $p=0,02$). On the other hand, no significant relationship was found between VO_{2max} and parameters which are influenced by high and low frequencies (SDNN, TP).

In conclusion, our data indicated that enhanced aerobic capacity increases HR vagal control and provide further support for autonomic system playing a role in adaptation to training.

Key words: Heart rate variability. Aerobic capacity. Autonomic adaptation to training.

Cardiovascular system adaptation of young elite athletes trained in different sports

Larins V, Pontaga I.

Latvian Academy of Sports Education, Riga, Latvia

Introduction: In many sports performance depends on cardiovascular system adaptation to used training and competitions loads. Adaptation process becomes evident with changes in cardiovascular parameters at rest and at physical load. The nature and size of these changes are very important for young athletes' health and achievements. Therefore the aim of our research was to estimate the heart structural and functional characteristics and cardiovascular system adaptation of young elite athletes trained in different sports.

Methods: The structural cardiac adaptation was estimated by echocardiography (Vivid 4, GE). The heart functional adaptation to the endurance training was determined on a cycle ergometer. The intensity of the exercises increased step by step from 0.5 to 2 W/kg, the exercise intensity - heart rate relationship was determined. Twenty 21,3±4,5 years old elite winter biathlon skiers, fourteen 18,3±4,3 years old cyclists and fifteen 17,3±0,8 years old male basketball players participated in the investigation.

Results: The largest heart stroke volumes were observed with cyclists (96.2± 16.2 cm³), a little smaller - with winter biathlon skiers (91.3±13.5 cm³). Basketball players had the largest heart volume in the end of the diastole. Nevertheless, their stroke volume was smaller (76.7 ± 15.7 cm³) in comparison with the athletes trained in endurance sports (p<0,05). Basketball players had higher heart rate values than the cyclists and athletes trained in winter biathlon during the same intensity exercises. The heart rate increase with growth of the power of exercises with basketball players was faster than with the athletes trained in biathlon and cycling.

Conclusion: Echocardiography characteristics of all athletes did not exceed the upper limits for trained males. The data confirm a better cardiovascular system adaptation to endurance exercises with the athletes trained in winter biathlon and cycling than with the young basketball players.

Key words: Cardiovascular system. Physical load. Adaptation.

Metabolic muscle damage and oxidative stress markers in an America's Cup yachting crew

Barrios C¹, Hadala M², Almansa I³, Bosch-Morell F³, Romero FJ³

¹Departments of Surgery¹ and Physiology², Valencia University Medical School, and Department of Physiology, Pharmacology & Toxicology, Cardenal Herrera CEU University, Valencia, Spain

Introduction: The America's Cup Challenge is the sailing event requiring the highest physiological and conditioning demands. In this study, muscle enzymatic activities involved in tissue damage and a marker of oxidative stress, malondialdehyde (MDA), were monitored in plasma of members of an America's Cup yachting crew. The preventive benefits of allopurinol (a xanthine oxidase inhibitor) on muscle damage were also tested.

Methods: Venous blood samples were taken from all 27 members of an America's Cup yachting crew. In period A, samples were obtained before the start of a 5-days fleet racing, after the last race (6 races in total), and after the 10 match races (8 days) corresponding to the 1st round of the 2007 Louis Vuitton's Cup. In period B, samples were collected just after the 2nd round of the Louis Vuitton's Cup (7 match races). In period B, crew members were randomly divided into 2 groups. One group (13 participants) received 300 mg/day of allopurinol (an inhibitor of xanthine oxidase), 3 hours before racing. The other 10-members group received placebo. Four sailors did not participate in this racing phase.

Results: All participants showed an increase in CK (46%, from 262.4 to 383.7 U/L, p<0.01), and AST (37.6%, from 27.2 to 37.4 U/L, p<0.05) activities in plasma both after the fleet and match races of period A. Grinders present maximal increases in CK activity (up to 80%). In period B, significant decreases in both plasma CK (from 445.8 to 333.6 U/L, p<0.05) and AST (36.3 to 31.1 U/L, p<0.05) activities appeared among participants receiving allopurinol. At the end of period A, plasma MDA levels were higher in all participants as compared to non-participant athletes (1.54 vs 1.18 nmol/mL, respectively, p<0.05). A statisti-

cally significant decrease (37,5%) in plasma MDA (from 1.55 to 1.03 nmol/mL, p<0.05) occurred in sailors treated with allopurinol during period B. Placebo group showed no change.

Conclusions: America's Cup is a sailing sport modality that increases muscle damage markers after races. Xanthine oxidase, a free radical-generating enzyme, seems to be implicated in the tissue damage occurring after this exhaustive exercise, in view of the effect of allopurinol.

Key words: Muscle damage. Oxidative stress. America's Cup.

Proposal of an estimation of VO₂ peak for patients with end stage renal disease

Cano M^{1,2}, Leppe J¹, Pacheco A³, Torres R³, Sanhueza ME³, White A⁴

¹Laboratory of Exercise Physiology, Faculty of Medicine, University of Chile; ²Group EFFECTS 262, Department of Medical Physiology, Faculty of Medicine, University of Granada; ³Nephrology Section, Department of Medicine, University of Chile, Clinical Hospital; ⁴Physiology and Biophysic Program, Institute of Biomedical Sciences, Faculty of Medicine, University of Chile.

Introduction: Fitness is determined by different criteria including the aerobic capacity, speed, coordination and muscle strength. There are different procedures to evaluate the aerobic capacity, being direct determination of the maximum oxygen consumption (VO₂ max) the most widely accepted method. Patients with an end-stage renal disease (ESRD) have a very poor fitness level caused by physiological alterations typical of this disease. The peak oxygen uptake (VO₂ peak) assessment is a good indicator to evaluate their physical functioning, since it correlates well with their survival rate and also is used to evaluate the impact of an exercise program on these patients. Nevertheless, the expensive equipment and amount of personnel required to perform these measurements make this procedure not applicable in most of the cases. A low-cost procedure is proposed to estimate VO₂ peak, using data as the work done on a cycle ergometer and body mass.

Material and method: 21 patients with renal insufficiency were evaluated through a breath-by-breath method (Vmax Spectra, SensorMedics Corporation) on cycle ergometer (Ergoline 800) during an incremental submaximal protocol (ramp increments of 15W/min) and data was analyzed with the Stata 9.0 statistical software to obtain a regression equation to estimate the VO₂ peak.

Results: Statistical analysis of estimated VO₂ peak (through the proposed formula: Estimated VO₂ peak = 3.377989 + (WBM * 9.76358)) and measured VO₂ peak showed high correlation (Pearson's r = 0.92, p<0.001) and measurement agreement between the two methods. WBM: Rate workload/body mass, expressed in Watts * Kg⁻¹.

Conclusions: The proposed equation provides a valid and accurate estimation of the VO₂ peak on ESRD patients with a low cost method.

Key words: VO₂ peak assessment. ESRD.

EXERCISE PHYSIOLOGY-IV LANGUAGE: ENGLISH

Physiological evaluation of disabled swimmers: low classes vs high classes

Madera J¹, Benavent J¹, Colado JC¹, Alkadar Y¹, Aymerich J², Tella V¹

¹Universitat de València; ²Universidad País Vasco

Introduction: In swimming, one of the aims of the training is the individualization of the swimming intensities along with the objective to optimize the training. Many of the physiological references for determining the swimming intensities are taken from swimmers without any type of functional disability. In fact, there are few studies that give relevant information about the physiological response in disabled swimmers. The International Paralympic Committee establishes 10 different classes depending on the loco motor ability of the swimmer. This way so, the purpose of the present study has been to analyze if there are physiological differences between disabled and non disabled swimmers at anaerobic and aerobic swim intensities.

Material and methods: 38 well-trained swimmers volunteered for the study: 7 disabled swimmers of the class 1 to 5 (G1), 12 swimmers of the class 6 to 10 (G2) and 19 swimmers without functional disability (G3). The test consisted of swimming 2 repetitions at maximum speed with 30' rest between them. The first

ORAL COMMUNICATIONS

Table 1. Madera J, et al. Descriptive (mean and standard mean error of both distances) R1 and R2 and significant differences for groups of the swim time (t) of every distance and of the maximum accumulation of lactate (LA).

	n	R1		R2	
		t(s)	LA (mmol/l)	t(s)	LA (mmol/l)
G1	7	201,97±25,85	6,47 ±0,75 ^{G2,G3}	69,98±5,82	8,19 ±0,59 ^{G2,G3}
G2	12	245,54±18,04	9,72±0,47 G1	80,05±6,07	12,11±0,49 G1
G3	19	218,48±4,41	10,05 ±0,64 ^{G1}	66,98±1,67	11,65 ±0,54 ^{G1}

G1, G2 and G3 P<0,01

repetition (R1) had a length of 223,99±7,87 seconds. The second repetition (R2) had a duration of 71,66±2,46 seconds. To the minutes 1, 3, 5, 7 and 9 after finishing every distance a sample of 5 µl of capillary blood was taken to determine the maximum accumulation of LA in R1 at an intensity of aerobic-anaerobic swim and in R2 at an anaerobic intensity. To determine LA, the lactate analyzer Lactate-Pro was used.

To find the descriptive ones (mean, standard mean error), standard statistical methods were used. To establish the differences of means between groups the test *t* was used for independent samples.

Results: The Table 1 shows the results obtained in every repetition by each of the groups.

Conclusions: At anaerobic and aerobic-anaerobic swim intensities, low class swimmers have a physiological lower response in comparison with high class swimmers and those without functional disability. Nevertheless, the high class swimmers have a physiological response similar to the swimmers without functional disability. Therefore, it would be advisable to individualize the analysis of the physiological answers in the swimmers of low classes with the objective to optimize the training intensities.

Key words: Functional classification. Lactate. Aerobic. Anaerobic.

Catecholamine and cortisol responses to maximal exercise in obese, overweight and lean adolescent girls

Zouhal H¹, Jabbour G^{1,2}, Jacob C², Ben Abderrahmane R¹, Youssef H¹, Delamarque P¹, Grats-Delamarque A¹, Moussa E².

¹Laboratoire Mouvement, Sport, Santé (M2S). UFRAPS, Université Rennes 2-ENS Cachan, France; ²Laboratoire de Physiologie et de Biomécanique de la Performance Motrice, Département d'Éducation Physique, Université de Balamand, Tripoli, Liban.

Introduction: Obesity is known to modify catecholamine and cortisol concentrations responses at rest and in response to exercise in adults, but the effect of obesity on these exercise-associated hormonal responses in adolescents is less known. Therefore, the aim of this study was to explore plasma catecholamine (adrenaline (A) and noradrenaline (NA)) and cortisol (C) concentrations at rest and in response to maximal exercise in three different groups of adolescent girls.

Methods: 34 adolescent girls aged 15-16 years volunteered to participate to this study. According to their body mass index (BMI) and their % of body fat (%BF) determined by dual-energy X-ray absorptiometry (DEXA), they were divided into three groups: a normal weight group (NO) (n=11, BMI = 21.55 ± 0.31 kg/m², %BF = 30.13 ± 1.35%) an overweight group (OW) (n=11, BMI = 26.55 ± 0.47 kg/m², %BF = 37.40 ± 1.03%) and an obese group (OB) (n=12, BMI = 32.92 ± 0.64 kg/m², %BF = 41.97 ± 1.33%).

One hour after a standardized breakfast, all the participants performed an incremental exhaustive exercise (Exe.) on a cycle ergometer to determine their peak oxygen uptake (VO_{2peak}). Plasma A, NA and C concentrations were measured at rest during fasting conditions (A₀, NA₀ and C₀), after a standardized breakfast (A_R and NA_R) and immediately after Exe. (A_{EX} and NA_{EX}). The responsiveness of the adrenal medulla to the sympathetic nervous activity was estimated by the ratio A/NA.

Results: VO_{2peak} (L/min) was significantly higher (p<0.05) in OB (2.32 ± 0.05) compared with NO (1.80 ± 0.06). However, VO_{2peak} (mL/min/kg) was significantly higher in NO (33.22 ± 1.24) and OW (30.14 ± 0.77) in comparison to OB (26.68 ± 0.97) (p<0.01 and p<0.05).

At rest during fasting conditions, A₀, NA₀ and C₀ were not significantly different between the three groups. However, the A₀/NA₀ was statistically lower in OB (0.18 ± 0.02) compared to OW (0.19 ± 0.01) and NO (0.20 ± 0.02) (p<0.05 and p<0.01).

At the end of Exe. A_{EX} and NA_{EX} were significantly higher than resting values in the three groups. However, no significant differences were reported between

OB (A_{EX} = 2.20 ± 0.13 nmol/L, NA_{EX} = 12.28 ± 0.64 nmol/L), OW (A_{EX} = 2.39 ± 0.23 nmol/L, NA_{EX} = 12.94 ± 0.93 nmol/L) and NO (A_{EX} = 2.52 ± 0.24 nmol/L, NA_{EX} = 12.60 ± 0.63 nmol/L).

Conclusion: Our results showed that at rest, in adolescent, girls the responsiveness of the adrenal medulla to the sympathetic nervous activity is lower in OB subjects compared to OW and NO ones. However, in response to maximal exercise plasma catecholamine are not affected by obesity.

Key words: Obesity. Overweight. Adolescents. Adrenaline. Noradrenaline. Cortisol.

Effect of submaximal exercise and thermal stress on antioxidant enzyme activity response

Riera J¹, Banquells M¹, Ferrer MD², Mestre A², Pons A², Drobnic F¹.

¹Centre d'Alt Rendiment Esportiu (CAR). Sant Cugat del Vallés, Barcelona; ²NUCOX, Laboratori de Ciències de l'Activitat Física, Departament de Biologia Fonamental i Ciències de la Salut, Universitat de les Illes Balears

This work is a pilot of a larger study designed to investigate the effect of exercise in a hot, humid environment on markers of oxidative stress and other physiological variables. Six male volunteers, physically active with a mean (±SD) age, height, weight, percent body fat, body surface and maximal oxygen consumption (VO_{2max}) of 43±7.9 yr, 179 ±9.7 cm, 78.6±9.6 kg, 13.4±2.8%, 1.97±0.16m² and 48.6±8.4 ml.kg.min⁻¹ respectively, performed two bouts of 40 minutes of running in a climatic chamber (CCI® Walk-in) in two different conditions: temperate environment (19-22°C temperature, 40-55% humidity) [TE] and hot, humid environment (30-32°C temperature, 75-78% humidity) [HH]. Two weeks before the test, all the subjects performed a maximal incremental exercise test on treadmill to determine his VO_{2max} and the minimal velocity that elicited VO_{2max} (vVO_{2max}). The subjects completed both sessions in a same day of two following weeks at speed corresponding to 70% of vVO_{2max}. During de test skin temperature was measured continuously with 4 skin thermistors (CCI® PT-100 Ω/0°C) placed in to the chest, right arm, thigh and calf, the mean skin temperature (T_{sk}) was calculated according to a Ramanathan formula and collected for analysis at rest (T_{sk0}) and every 5 minutes (T_{sk5}, T_{sk10}, ... T_{sk40}). Core temperature (T_c) was measured by intestinal pill system (Cor Temp 2000®) and collected for analysis at rest (T_{c0}) and every 5 minutes (T_{c5}, T_{c10}, ... T_{c40}). Polar® heart watch system was used to measure heart rate (HR) every 5 minutes (HR₀, HR₅, ... HR₄₀) and a microsample of blood (20 µl) was obtained from the ear lobe for lactate concentration ([La]) at rest (L₀) in the minute 20 (L₂₀) and immediately at the end of the test (L₄₀). Before and 1h after the test in both conditions (TE and HH) was made a whole blood extraction from venopuncture (40 ml) for the activity measurement of Catalase (Cat), Superoxide dismutase (SOD), Glutathione peroxidase (GPx) and Gutathione reductase (GR) in neutrophils, lymphocytes and erythrocytes. Statistics through Student's paired *t* test was conducted to detect significant differences between TE and HH conditions. We have found significant differences in T_{sk} (T_{sk0} to T_{sk40}), HR (HR₀ to HR₄₀), T_c (T_{c0} to T_{c40}) and Lactate at minute 40 (L₄₀). This results shown that the bout of exercise in this hot, humid environment (30-32°C temperature, 75-78% humidity) produce significant increase in parameters that reflect metabolic stress. However, Two Way ANOVA test did not find any effect of exercise and temperature on the antioxidant enzyme activity of Cat, SOD, GPx and GR on any of the cell lines observed.

We conclude that this protocol of exercise: 40 minutes of running at 70% of VO_{2max}, in a hot, humid environment: 30-32°C temperature, 75-78% humidity, produced thermal stress but it is not sufficient to produce adaptations in antioxidant enzyme activity of Cat, SOD, GPx and GR.

Key words: Thermal stress. Submaximal exercise. Antioxidant enzymes.

Intermittent normobaric hypoxia and running economy

Riera J, Galilea P, Pons V, Drobnic F.

Centre d'Alt Rendiment Esportiu (CAR). Sant Cugat del Vallés, Barcelona

This study was designed to analyse the effect of intermittent normobaric hypoxia training (IHT) in running economy (RE). Seven subjects, trained runners and triathletes, participated in the study [age 33.7±14; %body fat 7.72±5.7; Maximal O₂ consumption (VO_{2max}) 58.38±12.9 ml.Kg⁻¹.min⁻¹]. Their respective individual training schedule remained unaltered during the experimental period. They completed a minimum of 15 and a maximum of 20 sessions of IH in consecu-

tive days, 5 days per week during 3-4 weeks with the following protocol: 6min hypoxia-4min normoxia for 90 min. During all the IH session, haemoglobin saturation (O_2Sa) was monitored continuously from the fingertip by pulse oximetry, and the inspired fraction of O_2 (F_iO_2) was programmed in each session to obtain a O_2Sa around 80%. Two weeks before the beginning of the IH protocol, all the subjects performed a maximal incremental exercise test on treadmill to determine his VO_{2max} and the minimal velocity that elicited VO_{2max} (vVO_{2max}). During the week before and after the intervention, all the subjects made a whole blood extraction for the measurement of haemoglobin (Hb), %reticulocytes (%Re) and Ferritin. Submaximal treadmill running test (6min effort-4min recovery, 0% slope) was performed to assess RE at three velocities, corresponding at 75%, 80% and 85% of the vVO_{2max} (V_1, V_2, V_3). VO_2 , minute ventilation (V_E), ventilatory equivalent for O_2 (V_E/VO_2), tidal volume (V_T), respiratory frequency (f), respiratory exchange ratio (RER) and heart rate (HR) were averaged to the two last minutes of each run, and blood was taken for lactate concentration ([La]) analysis immediately at the end of each run. An hypoxic tolerance test (20 min of hypoxic exposure at F_iO_2 of 13.4% -3500m-) was performed previously in order to know susceptibility to hypoxia and to establish the F_iO_2 of the first session. The average F_iO_2 for the first and the last series were of 11, 7% (9-13) and 10% (8.5-11.5), corresponding to a simulated height of 4500 and 5600m respectively. The averaged O_2Sa measured for all session was of 82.8 (67-91).

An ANOVA test for repeated measures was conducted to detect differences between the work sessions. We didn't measure any significant difference in V_{O_2} , V_E , V_E/VO_2 , V_T , f, RER, and HR. The haematological indexes, including Hb, %Re and ferritin, were not modified by the hypoxic exposure. Nevertheless V_E and V_E/VO_2 diminished after the exposition to IHT in noticeable percentages 3.6% and 2.1% respectively, although not statistically significant. These results probably shown a moderate but not statistically significant improvement of ventilatory economy, probably due to the reduced sample.

We conclude that IHT at rest with 6 minutes of hypoxia and 4 minutes of normoxia during 90 minutes, 5 consecutive days for week, during 3-4 weeks, not elicited an improvement of measures related with RE and haematological indexes in a not well balanced group of runners and triathletes.

Key words: Normobaric hypoxia. Running economy.

Ventilatory response to exercise in healthy young men with Down syndrome

Cabeza-Ruiz R¹, Naranjo-Orellana J², Beas-Jiménez JdD², Centeno-Prada RA², Alonso-Alfonseca J².

¹Universidad de Sevilla. Seville, Spain; ²Centro Andaluz de Medicina del Deporte. Seville, Spain

Objective: To analyze the ventilatory response to exercise in actives males with Down Syndrome.

Material and methods: 13 males (26.6 ± 6.6 years, 66.5 ± 7.5 kg and 159.0 ± 3.1 cm) performed a cycle test until subjective exhaustion. The test started at 25 watts increasing 10 watts every minute. The expired air was collected through a facial mask and analyzed breath by breath. We focused our attention in the analysis of CO₂ output (VCO₂, L/min), ventilation (VE, L/min), mean inspiratory flow (VT/Ti, L/s) and the relationship between inspiratory and total time (Ti/Ttot). Ventilatory efficiency was measured as the slope between VE and VCO₂ from 25 watts to maximal power output (delta CO₂).

Results: Delta CO₂ was 0.033 ± 0.007; Ti/Ttot remained constant along the test (0.42 ± 0.06) while VT/Ti showed a constant increase along the test with a linear relationship with VE ($y = 0.033x + 0.017$; $R^2 = 0.997$).

Discussion: These values are very similar to those previously reported and observed in our Laboratory between sportspeople and not handicapped population. However there are two aspects which need additional studies: 1) the Ti/Ttot values are lower (according to literature we usually see values from 0.48 to 0.50) and 2) we have observed a tendency to decrease delta CO₂ at the higher intensities and we can not explain it at the moment.

EXERCISE PHYSIOLOGY-V

LANGUAGE: ENGLISH

Total haemoglobin mass and cardiac volume in endurance trained paraplegic athletes

Schumacher YO, Ruthardt S, Ahlgrim C, Roecker K, Pottgiesser T
Medizinische Universitaetsklinik Freiburg

Introduction: The oxygen transport is crucial in the determination of maximal oxygen uptake (VO_{2max}) and an important component in the limitation of endurance performance in able bodied and paraplegic athletes. Currently, there is no information on the adaptations and interactions of these systems to chronic endurance exercise in paraplegic athletes. The aim of the present study was therefore to investigate two major components of the oxygen transport entity (total haemoglobin mass (tHb) and cardiac volume (HV)) in highly endurance trained paraplegic athletes (PARA-TRAINED) and to compare the results with those of untrained paraplegic controls (PARA-UNTRAINED) and able bodied elite endurance athletes (TRAINED).

Methods: 25 PARA-TRAINED athletes, 10 PARA UNTRAINED and 25 TRAINED subjects were included in the study. tHb was determined using a carbon monoxide rebreathing method, HV was measured echocardiographically.

Results: tHb was significantly higher in PARA-TRAINED than in PARA-UNTRAINED (10.3 ± 1.3 g/kg vs. 7.9 ± 2.0 g/kg (mean ± SD)), while HV showed no significant differences between the two groups (10.6 ± 1.4 ml/kg vs. 10.3 ± 2.5 ml/kg). However, tHb in PARA-TRAINED was lower than in TRAINED (12.6 ± 1.3 g/kg).

Conclusion: In paraplegic athletes, tHb but not HV adapts to chronic endurance exercise. tHb in PARA-TRAINED athletes does not reach the level of TRAINED subjects.

Key words: Blood volume. Sports. Heart.

VO_{2max} determines a different nonezymatic antioxidant response to a maximal aerobic test

Izzicupo P¹, Bucciarelli V², Pennelli A², Di Valerio V¹, Di Mauro M², Gallina S², Di Baldassarre A¹

¹Dept of Biomorphology; ²Dept of Human Movement, University "G. d'Ammozio", Chieti-Pescara, Italy

Reactive Oxygen Species (ROS) are reactive compounds that are naturally produced during aerobic metabolism. To limit their harmful effects, the organism requires complex protection, the antioxidant system, that consists of antioxidant enzymes (catalase, superoxide dismutase...) and nonezymatic antioxidant including vitamin E, A, C, glutathione, β -caroten, etc. Even though nontoxic quantities of ROS mediate several biological processes, an imbalance between their production and antioxidant defence leads to an oxidative stress state, which is involved in aging process and in several pathology. Physical exercise, increasing ROS production, can contribute to the alteration of the redox state, determining fatigue and impaired recovery from exercise. In particular, aerobic exercise is accompanied by an increase of VO_2 , which, in turn, may increase ROS, and activate the enzymatic antioxidant activity. Non enzymatic antioxidant concentrations are also modified, but results are often contradictory. For these reasons, aim of our study was to analyze whether the antioxidant adaptation could be correlated with VO_{2max} . In particular, we focused our attention on the maximal tests-induced modifications in plasma concentration of Vitamin E, A, β -caroten and lycopene observed in endurance athletes with different VO_{2max} . Sixty-eight long distance male runners, 37 ± 4.4yr; underwent a maximal stress test during which both cardiac and pulmonary parameters were monitored. Subjects were divided on the basis of the VO_{2max} (High VO_{2max} ≥ 49.89, low VO_{2max} ≤ 44.69 ml/kg-1/min-1), and the athletes with VO_{2max} values between 44.69 and 49.89 ml/kg-1/min-1 were excluded. As shown in the table, no differences in the basal antioxidant levels were observed in the two groups. Interestingly, the maximal test did not induce any substantial difference in the antioxidant concentration levels in the High VO_{2max} subjects, whereas the low VO_{2max} group displayed a significant decrease in the Vitamin A concentration, that did not correlate with the β -caroten (the Vitamin A precursor) levels. This findings suggests that antioxidant adaptation may be correlated with VO_{2max} . Indeed, in Low VO_{2max} subjects Vitamin A plasma concentration decreases during exercise because of its utilization against ROS. On the other hand Vitamin A. seems to be rapidly mobilized from

Table 1. Izzicupo P, et al.

	low VO_{2max} (n=18)		High VO_{2max} (n=25)	
	BL	PE	BL	PE
Vitamin E (mg/L)	16.90 ± 4.07	16.04 ± 4.73	16.52 ± 3.17	16.82 ± 2.86
Vitamin A (mg/L)	0.89 ± .23	0.85 ± .20**	0.89 ± .18	0.90 ± .18
β -caroten (mg/L)	0.69 ± .47	0.67 ± .40	0.76 ± .45	0.78 ± .41
Lycopene (mg/L)	0.38 ± .14	0.38 ± .13	0.35 ± .14	0.37 ± .13

BL: Basal Level; PE: Post Exercise. Values are expressed as mean ± SD. Values statistically different ($P < 0.002$, by ANOVA) from BL are indicated by**.

ORAL COMMUNICATIONS

its reserve in HighVO_{2max} group in order to preserve more efficiently the body against ROS (Table 1).

Key words: Vitamin A. VO_{2max}. ROS.

Oxygen uptake kinetics during front crawl swimming

Rodríguez FA¹, Keskinen K², Keskinen O³

¹Institut Nacional d'Educació Física de Catalunya, Universitat de Barcelona, Barcelona, Spain; ²Finnish Society for Research in Sport and Physical Education, Helsinki, Finland; ³Department of Biology of Physical Activity, University of Jyväskylä, Jyväskylä, Finland

Table 1. Rodríguez FA, et al.

	Males (n = 12)		Females (n = 7)	
	100 m	400 m	100 m	400 m
Average speed (m·s ⁻¹)	1.643 (0.08)*	1.393 (0.07)*	1.478 (0.05)	1.283 (0.04)
VO ₂ peak (mL·min ⁻¹)	3605 (300)*	3995 (385)*	2640 (270)	2804 (258)
VO ₂ peak (mL·kg ⁻¹ ·min ⁻¹)	48.8 (3.4)*	53.8 (3.4)*	42.8 (4.4)	45.2 (4.2)
Time constant τ _e (s)	24.8 (6.9)	28.4 (5.4)	25.4 (8.7)	30.3 (3.8)
O ₂ deficit (mL)	1400 (565)	1575 (398)	974 (426)	1268 (572)
Peak blood lactate (mmol·L ⁻¹)	12.7 (3.8)	13.1 (3.4)	9.8 (3.6)	8.0 (4.1)

*p<0.05 compared with females

Introduction: The aim was to characterize the oxygen uptake (VO₂) kinetics during 100 and 400 m maximal swims.

Materials and methods: Nineteen competitive swimmers aged 16-23 years (12 males, 7 females), categorized into sprinters (SP, n=10) and non-sprinters (non-NS, n=9), swam 100 and 400 m at maximal speed using the front crawl in a 50-m indoor pool. VO₂ was measured breath-by-breath using a previously validated snorkel connected to a portable gas analyser (K4 b², Cosmed, Italy). Data were subsequently averaged and fitted to mono-exponential functions.

Results: See Table 1. VO₂ kinetics was fastest during the shortest swim, with time constants τ of 25.0 (SD 7.44) and 29.2 (4.78), respectively. τ was not different in SP as compared with non-SP in either distance (p > 0.05), and did not correlate with swimming speed (r = 0.01, 0.11). Peak VO₂ significantly correlated with speed both in 100 (r = 0.84) and 400 m (r = 0.78).

Conclusions: As in other types of exercise, VO₂ kinetics depends on swimming intensity and duration. τ for 100 m (23 s) is almost equal to that measured at the muscle level by NMRS (24 s). Fast O₂ kinetics appears to be a general adaptation to training, possibly due to the prevalent type of interval training used in this sport.

Key words: Oxygen uptake. Testing. Breath-by-breath gas analysis.

Bioenergetic profile of tennis singles match play

Baiget E^{1,2}, Iglesias X¹, Rodríguez FA¹

¹Institut Nacional d'Educació Física de Catalunya, Universitat de Barcelona, Spain; ²Departament d'Expressions Artístiques, Motricitat Humana i Esports, Universitat de Vic, Spain

Introduction: This study aims to characterize the metabolic response during tennis singles match play in order to establish a bioenergetic profile of male singles tennis competition.

Materials and methods: 20 male competitive players (4 ATP, 16 ITN 1-4) participated in 10 tennis singles matches to the best in two sets. Games were played on average-speed hard surface (Green Set®). Ventilatory and gas exchange parameters were measured with a portable breath-by-breath gas analyser (K4 b², Cosmed, Italy). Between 2 and 7 days afterwards subjects performed a specific endurance tennis test (SET-Test) using the same analyser. During the incremental test the first (VT₁) and second (VT₂) ventilatory thresholds were identified.

Results: A total of 20 sets and 170 games were played. Average set duration was 31:03 ± SD 11:23 min:s. Average VO₂ values of 29.9 ± 3.7 mL·kg⁻¹·min⁻¹ (51.6 ± 8.6 % of VO_{2max}) were measured. The players exercised 77.2 ± 24.5 % of the

time (22:14 ± 08:26 min:s) at an intensity below AT₁; 20.0 ± 21.2 % (07:14 ± 09:25 min:s) was played between VT₁ and VT₂; only 2.9 ± 4.7 % (01:00 ± 01:55 min:s) time was played over AT₂.

Conclusions: The moderate VO₂ values suggest that the oxygen transport system is not a limiting factor for tennis performance. Since players spend a lot of time at rest between points (77.9 %), the average intensity during most of the actual playing time is moderate (i.e. within the aerobic-anaerobic transition phase), although interspersed with the characteristic explosive actions. Playing phases over the respiratory compensation point (i.e. causing lactic acidosis) are minimal, although they might happen at crucial moments during the game.

Key words: Tennis. Intermittent exercise. Oxygen uptake.

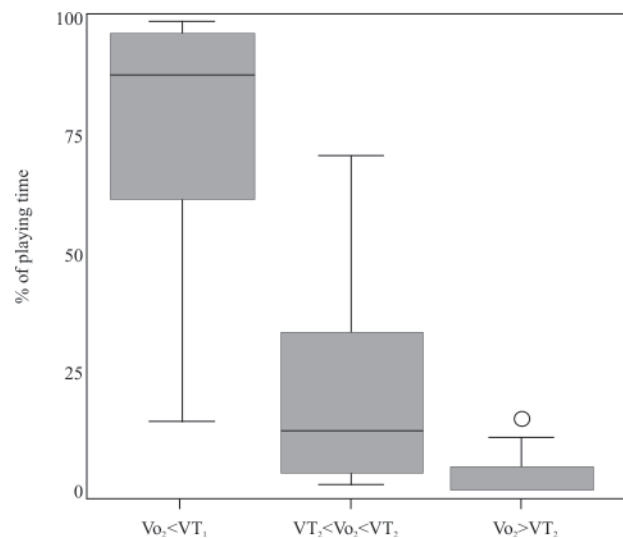


Figure 1. Baiget E, et al. Playing time (%) spent below AT₁, in the transition phase between AT₁ and AT₂, and over AT₂ during the games (n = 20).

The adrenal gland histo-morphology is modified by the frequency of endurance training in rats

Poulain S¹, Zouhal H¹, Turlin B², Lahaye-Le Douairon S¹, Malarde L¹, Lemoine-Morel S¹, Carré F³, Vincent S¹.

¹Laboratoire Mouvement, Sport, Santé (M2S). UFRAPS, Université Rennes 2-ENS Cachan, France; ²Département d'anatomie pathologique. Faculté de médecine, Université de Rennes 1, France; ³Laboratoire de Physiologie Médicale, Faculté de médecine, Université de Rennes 1, France.

Introduction: Endurance training is known to induce an increase of adrenal gland mass and volume in rats. However, the frequency of endurance training which induces these adaptations remained to be clarified. Then, the purpose of the present study was to compare the effects of two programs of endurance training with different frequencies, on the adrenal gland (AG) and the adrenal medulla (AM) in young Wistar male rats (9-weeks-old).

Methods: 19 rats were randomly assigned to one of three groups: untrained (UT), trained 2 times a week (T2) and trained 5 times a week (T5). Training consisted in 8 weeks of 1h/day of endurance training on treadmill at a speed of 20 m/min up a 10 degrees incline. All rats were weighted at the beginning and the end of the experiment. 24h after the last training session, animals were scarified and the adrenal glands were removed, weighted and frozen for subsequent analysis. The method of volume determination was based on the measurement of the elliptical surface of every cut of 10µm thicknesses spaced out by 99 cuts. Formula used was vol (mm³) = Σ each surface x 0,1. The ImageJ software calculates the surface from the number of pixels present. The surface delimitation was determined manually.

Results: Endurance training induced a significant lost of body mass in T2 (460 ± 24 g) and T5 (450,4 ± 29 g) but not in UT (514 ± 17 g). Only endurance training 5

times a week induced a higher mass of adrenal gland (UT: 30 ± 6 mg vs. T2: 26.8 ± 8.0 mg vs. T5: 36.5 ± 5.0 mg). Moreover, T5 had a higher volume of AG (27.04 ± 5.60 mm³) and AM (1.83 ± 0.44 mm³) than UT (AG: 20.88 ± 4.77 mm³; MS: 1.59 ± 0.35 mm³) and T2 (AG: 19.31 ± 3.86 mm³; AM: 1.52 ± 0.25 mm³).

Conclusion: In young rats, it seems that the frequency of training may play a major role in adrenal gland adaptations. This phenomenon is generally explained by a prolonged and repeated activation of the sympathetic nervous system. The higher volume of AG and AM in T5 group can be explained by a change in the number of cells within the adrenal gland, and/or size of cells, or by a modification of the extracellular volume.

Key words: Adrenal gland. Adrenal medulla. Endurance Training. Frequency.

EXERCISE PHYSIOLOGY-VI

LANGUAGE: ENGLISH

Maximum oxygen uptake vs level of performance in judo

Blasco Lafarga C^{1,2}, Pablos Abella C¹, Garrido Chamorro RP^{3,4}.

¹Department of Physical Education and Sport, University of Valencia, Spain; ²Consell Valencià de l'Esport (Valencian Council of Sport). ³General Hospital, Alicante, Spain; ⁴CEADE medical centre, Almoradi, Alicante, Spain.

Introduction: There is some controversy about the utility of increasing the VO_{2max} to improve the performance in judo, though many studies point to the benefits. We have studied the relationship between VO_{2max} and performance in Judo, analysing whether there are significant differences according to the sporting level, and comparing what happens with this same analysis when assessing performance through a specific judo test.

Material and methods: We have made a descriptive study with 26 male Spanish judoists (national and international level; 21.12±3.32 years; 74.53±9.79 kg, 11.36±2.10% of fat, 58.22±7.16% of muscle mass) divided into three groups

Table 1. Blasco Lafarga C, et al. Statistical descriptives: Mean, standard deviation, minimum and maximum rate for VO_{2max} (ml/Kg/min), MMVO_{2max} (ml/MMKg/min) and FFVO_{2max} (ml/FFKg/min) in male judoist

Variable	Groups of Level	N	Mean	Dev.	Minimum	Maximum
VO _{2max}	Average	13	58,4308	8,79596	45,2	73,7
	Good	6	63,8000	8,98933	47,9	73,3
	Very Good	7	61,0143	11,34349	49,2	77,4
	Total	26	60,3654	9,43801	45,2	77,4
MMVO _{2max}	Average	13	102,0231	18,31985	81,2	135
	Good	6	101,5667	6,69049	93,1	111
	Very Good	7	107,2143	11,17116	93,6	122
FFVO _{2max}	Average	13	66,4462	8,69680	50,6	81,4
	Good	6	71,9333	10,28351	53,3	81,4
	Very Good	7	67,4857	12,11548	54,5	84,9
Total	Average	13	66,4462	8,69680	50,6	81,4
	Good	6	71,9333	10,28351	53,3	81,4
	Very Good	7	67,4857	12,11548	54,5	84,9

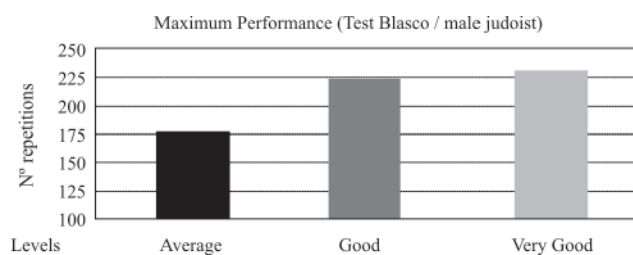


Figure 1. Blasco Lafarga C, et al. Mean and standard deviation for the T. Blasco (Judo Specific Test) in male judoist

Table 2. Blasco Lafarga C, et al. Statistical descriptives: Mean, standard deviation, minimum and maximum rate for the T. Blasco (Judo Specific test) in male judoist

Variable	Groups of Level	N	Mean	Dev.	Minimum	Maximum
Repetitions on the Judo	Average	11	186,91	18,17	153	216
	Good	7	223,86	18,73	188	243
Specific test (T. Blasco)	Very Good	6	241,33	8,57	228	251
	Total	24	211,29	28,61	153	251
Post-hoc	Groups of level (I-J)		Dif. Mean (I-J)	Std. Error	Sig.	
Tukey HSD	Good	Average	36,948(*)	8,019	0,000	
	Very Good	Average	54,424(*)	8,418	0,000	
	Very Good	Good	17,476	9,228	0,165	

(Average, Good and Very Good) according to their level of performance. We have made an anthropometry, a treadmill VO_{2max} test (Wasserman protocol), and a specific judo test, looking for statistically significant differences in each case (one way ANOVA) related to that level. VO_{2max} has been analysed in relative terms, depending on the fat-free mass (FF), and muscle mass (MM).

Results: Comparing to what happened on the results of the Judo Test (Figure 1, Table 2: p<0.001 between Very Good and Average judoists; also between Good and Average), we have not found significant differences in any of the three expressions of VO_{2max} analysed (Table 1). Despite this, the results of the Treadmill Test have been adequate (VO_{2max}: 60.37±9.44 ml/kg/min; FFVO_{2max}: 67.99±9.89 ml/FFkg/min; MMVO_{2max}: 103.32±14.35 ml/MMkg/min; Aerobic Maximum Speed: 17.33±1.58 km/h; FCM: 192.85±7.69 p/m; one minute recovery lactate: 9.63±2.47 mMol).

Conclusions: There are no significant differences in VO_{2max} according to the level of performance; VO_{2max} and FFVO_{2max} show the same trend, while MM-VO_{2max} shows different; VO_{2max} allows comparing individuals in the same weight category, while MMVO₂ seems to reflect better the muscle efficiency of each judoist; We need further studies to deepen in the relationship between MMVO_{2max} and performance in Judo.

Key words: Judo. Performance. VO_{2max}.

The response to resistance training is attenuated in aged individuals after disuse muscle atrophy

Sueta Charlotte¹, Justesen Lene¹, Hvid Lars G², Christensen Ulrik², Magnusson S. Peter¹, Kjaer Michael¹, Aagaard Per²

¹Institute of Sports Medicine Copenhagen, Bispebjerg Hospital, University of Copenhagen, Denmark; ²Institute of Sport Science and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark

Introduction: Sarcopenia has long been recognized as a major cause of muscle strength loss in old age, however, the additional impact of immobilisation and re-training on muscle mass and architecture has not previously been investigated in elderly human individuals.

Methods: Nine old men (age 61-74 yrs) and eleven young (age 21-27 yrs) underwent 2 weeks of unilateral whole leg casting followed by 4 weeks of re-training. Maximal voluntary contraction strength, neuromuscular activation, anatomical muscle cross sectional area, quadriceps muscle volume, muscle fibre pennation angle, physiological cross sectional area and specific force were assessed before, after immobilisation and again after re-training.

Results: Both old and young men experienced decreases in anatomical muscle cross sectional area, muscle fiber pennation angle, maximal voluntary contraction strength and specific force after 2 weeks of immobilisation (p<0.05). However, muscle fiber pennation angle and anatomical muscle cross sectional area were more reduced in young than old men (OM: - 4.7%, YM: -8.1%, p<0.05) and subsequent, re-training led to larger increases in anatomical muscle cross sectional area, quadriceps muscle volume and muscle fiber pennation angle (p<0.05) in young compared to old men. In contrast, quadriceps activation was reduced in old men after immobilisation (OM: - 9.9 %, p<0.05) while young men were unaffected (YM: -1.0 %, n.s.).

Discussion: The present study is the first to demonstrate that aging alters the neuromuscular response to short-term disuse and recovery in humans. Notably,

ORAL COMMUNICATIONS

immobilisation has a greater impact on the efferent neuronal function in old individuals, while young individuals were more affected at the muscle level. In addition, old individuals showed an attenuated response to re-training after immobilisation compared to young individuals.

Key words: Resistance training. Muscle atrophy. Neuromuscular response.

Peak power in obese, overweight and lean adolescents boys: effects of aerobic fitness

Jabbour G^{1,2}, Zouhal H¹, Jacob C², Ben Abderrahmane R¹, Lemoine-Morel S¹, Youssef H¹, Tabka Z³, Moussa E²

¹Laboratoire Mouvement, Sport, Santé (M2S). UFRAPS, Université Rennes 2-ENS Cachan, France; ²Laboratoire de Physiologie et de Biomécanique de la Performance Motrice, Département d'Éducation Physique, Université de Balamand, Tripoli, Liban; ³Laboratoire de physiologie et des explorations fonctionnelles, faculté de médecine Ibn El Jazzar, Sousse, Tunisie.

Introduction: The aim of this study was to explore the effects of obesity on cycling peak power (CPP) and the influence of aerobic fitness on this CPP in three different groups of adolescent boys.

Methods: A total of 60 adolescent boys aged 13-15 years participated in this study. 20 obese (OB) (mean body mass index, BMI = 31.4 ± 2.7 kg/m²; % of body fat (%BF) = 36.7 ± 8.2 %), 20 overweight (OW) (BMI = 24.5 ± 1.7 kg/m²; %BF = 23.6 ± 4.7%) and 20 lean subjects (LS) (BMI = 19.2 ± 1.1 kg/m²; %BF = 16.5 ± 3.3%). All the subjects performed on a cycle ergometer two tests on two different days (D1 and D2). On D1 each subject performed a continuous, progressive protocol to determine his peak oxygen uptake (VO_{2max}). An open circuit technique was used to determine VO_{2max}. On D2, at least two days after D1 but no more than one week later, the force-velocity test (F/V test) was performed to determine CPP.

Results: VO_{2max} (L/min) was higher in OB (2703 ± 509) compared with LS (2228 ± 304) (p<0.001) and was strongly body mass (BM)-related (r = 0.65, p<0.05). However, VO_{2max} (mL/min/kg) was significantly higher in LS (43.7±4.9) (p<0.00001) and OW (36.9 ± 5.6) (p<0.0001) in comparison to OB (30.4±4.6). When the VO_{2max} was reported to the fat-free mass (mL/min/kgFFM), only LS showed higher values (51.8±5.1) in comparison to OB (47±8) (p<0.01). CPP (W), was higher in OB (622 ± 148) compared with OW (485±114) (p<0.001) and LS (468 ± 95) (p<0.0001) and it was strongly correlated to the BMI (r = 0.4 for p<0.05). However, when reported to BM, CPP (W/kg) was significantly higher in LS (9.1±1.6) compared with the OB (7 ± 1) (p < 0.00001) and OW (7.3 ± 1.3) (p<0.0001) and it was negatively correlated to %BF (r = -0.66, p<0.05) and BMI (r = -0.3, p<0.05). When CPP was reported to the fat-free mass (W/kgFFM), the difference between OB and LS disappeared but the Pmax remained higher in LS (10.8 ± 1.6) in comparison to OW (9.5 ± 1.3) (p<0.01). A positive relationship was obtained in all subjects between relative CPP and relative VO_{2max} (r = 0.7; p<0.05 for values adjusted to BM) and (r = 0.4; p<0.05 for values adjusted to FFM).

Conclusion: Our results showed that CPP was affected by obesity status. They also suggest that aerobic fitness may affect negatively the CPP in obese group.

Key words: Obesity. Overweight. Adolescents. Peak power. Aerobic fitness.

Anthropometric and physiological characteristics of elite Serbian basketball players

Mazic S¹, Suzic J¹, Dikic N², Ostojic S¹, Djelic M¹, Ilic V¹, Nestic D¹, Radovanovic D³

¹Institute for Medical physiology, School of Medicine, University of Belgrade; ²Sports Medicine Association Serbia; ³Olympic Committee Serbia

Aim: The purpose of this study was to describe anthropometric and physiological characteristics of elite Serbian basketball players and to evaluate whether players in different positional roles have different physical and physiological profiles.

Materials and methods: Over six years we performed 702 functional testing and examined 256 basketball players from First National League as well as National team. We measured Body Height (BH), Body Weight (BW), percentage of Body Fat (%BF), by BIA and skinfolds method and Percentage of Muscles (%M). We

also performed maximal incremental protocol on treadmill, method breath by breath (Jaeger, Oxycon Pro) and determined Maximal Oxygen Consumption (VO_{2max}). We recorded Heart Rate at rest (HR), at the end of the test (HR_{max}), at anaerobic threshold (HR_{AT}), during recovery in 1st and 3rd minute (HR 1min, HR 3min).

Results: Average age was 21,57±4,58 years, BH 199,11±8,54 cm, BW 94,45±12,44 kg, % BF 10,41±3,98, %M 50,93±2,78, HR 63,11±10,63 bpm, VO_{2max} 53,07±6,21 ml min⁻¹ kg⁻¹, HR_{max} 184,46±10,54 bpm, HR_{AT} 177,14±10,87 bpm, HR_{1min} 145,15±15,33 bpm, HR_{3min} 108,81±15,16 bpm.

Conclusion: Anthropometric and functional characteristics of the elite basketball players varied among different positional roles. According to the references, the results of the present study demonstrate that a strong relationship exists between anthropometric and physiological characteristics of Serbian and Greek and Lithuanian basketball players.

Key words: Basketball. Anthropometry. Functional evaluation. Maximal oxygen consumption.

3-months multivariate aerobic training abolish exercise-induced lipid peroxidation in overweight adolescent girls

Youssef H¹, Groussard C¹, Lemoine-Morel S¹, Pincemail J², Jacob C³, Moussa E¹, Pineau JC⁴, Cillard J¹, Delamarche P¹, Gratas-Delamarche A¹

¹Laboratoire Mouvement, Sport, Santé (EA1274). University of Rennes 2, ENS Cachan. UFR-APS. France; ²University of Liège - CHU, Department of Cardiovascular surgery. Liège, Belgium; ³Laboratoire Physiologie et Biomécanique de la Performance Motrice. University of Balamand. Tripoli, Lebanon; ⁴Dynamique de l'évolution humaine UPR 2147 CNRS, Paris, France.

Adolescence obesity is increasing in whole world. Several studies reported higher lipid peroxidation at rest and in response to isolated exhaustive exercise in obese adolescents and adults compared to non-obese ones (Youssef, *et al.* in revision, Vincent, *et al.* 2005). In non obese subjects, aerobic training is beneficial since it decreased lipid peroxidation. Thus, the aim of this study was to investigate whether 3-months of multivariate aerobic training would reduce lipid peroxidation at rest and after maximal exhaustive exercise in overweight adolescent girls.

Methods: Non-obese (9 control and 7 trained) and overweight (9 control and 14 trained) adolescent girls (age: 14-19 years, BMI: 20-35.5 kg/m²) participated to this study. Anthropometric parameters and VO_{2peak} were measured. Pre and post-exercise lipid peroxidation markers were evaluated in plasma (15F₂-isoprostanes [F₂-Isop], lipid hydroperoxide [ROOH], oxidized LDL [ox-LDL]).

Results: Overweight trained subjects increased the fat-free mass and decreased the fat mass and the hip circumference but did not modify aerobic capacity. No significant effect of training was observed in both groups (non-obese and obese) on the resting lipid peroxidation markers, whereas 3-months multivariate aerobic training attenuated the exercise-induced lipid peroxidation in non-obese (ox-LDL) (Figure 1) and obese overweight subjects (F₂-Isop, ROOH, ox-LDL) (Figure 1 and 2).

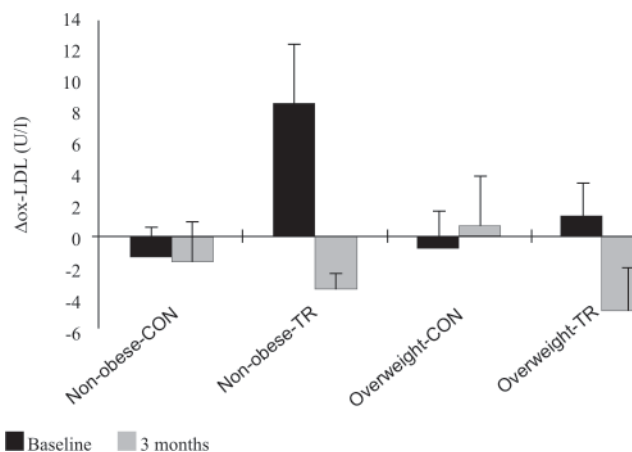


Figure 1. Youssef H, *et al.* Decrease in change from pre to post-exercise oxidized LDL (Δ ox-LDL) in non-obese and overweight groups. CON: control, TR: trained. * Significant difference from baseline to 3months; p<0.05

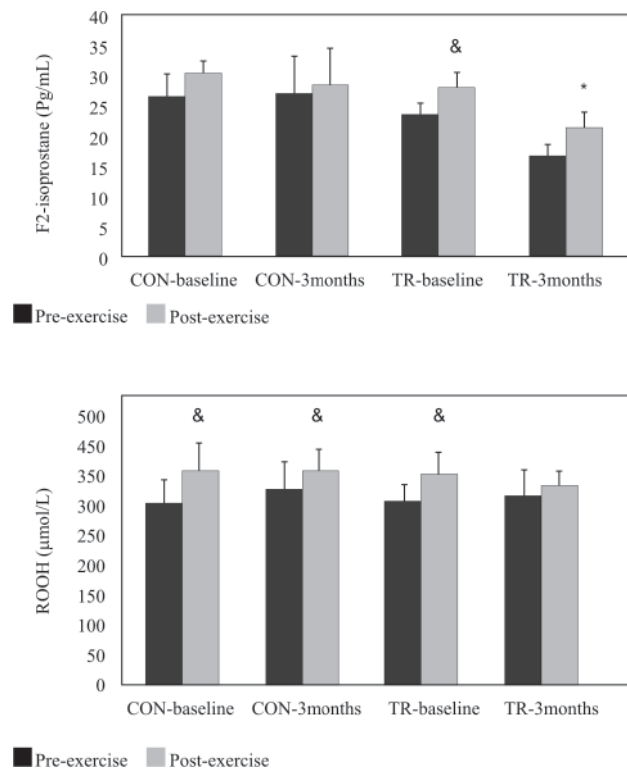


Figure 2. Pre and post-exercise values at baseline and 3 months only in overweight groups for F₂-Isop and ROOH. * Significant difference from baseline to 3months; p<0.05. & Significant difference from pre to post exercise; p< 0.05.

Conclusion: 3-months multivariate aerobic training improved the tolerance to exercise-induced oxidative stress in overweight adolescent girls.

Key words: Obesity. Adolescence. Exercise training. Lipid peroxidation.

GENETICS AND MOLECULAR BIOLOGY-I

LANGUAGE: ENGLISH

Association between the VDR Ff polymorphism, muscle strength and a national athlete status

Dongho Park¹, Changsun Kim², Shineon Lee³

¹Department of Exercise Sports & Leisure Studies, Inha University, Korea; ²Department of Sport for All, Gyeongju University, Korea; ³Department of Physical Education, Kyung Hee University, Korea.

Background: Bone mineral density (BMD) is under strong genetic control and the genetic difference among individuals partly explains variance in adaptive response to exercise through gene-environment interaction. It has been demonstrated that skeletal muscle is a target organ for vitamin D and vitamin D deficiency is associated with muscle weakness. Muscle strength is considered to be an important predictor of BMD and also, is one of most important factors to determine elite athlete performance.

Purpose: The aim of this study was to determine whether the vitamin D receptor (VDR) gene polymorphism affected muscle strength in general population (CON) and was related with athlete performance in a national athlete (NA) status.

Method: The VDR genotypes, as detected by endonuclease *FokI*, bone phenotypes of the calcaneus, grip and back strength were examined in 409 general people (male n= 193, female n=218). The VDR genotype of 540 national athletes (male n= 339, female n= 201) was also determined.

Results: No significant association was found between the VDR genotypes and the BMD related variables (T-score, BUA and SOS) at the calcaneus, although

there was a trend for an association between VDR genotypes (FF & Ff > ff) and BMD at the calcaneus in CON. However, the female subjects in CON with the VDR FF (40.5±13.4) and Ff (41.3±14.0) genotypes had a greater grip strength than the female subjects with ff genotype (34.6±13.8), respectively (p<0.05, p<0.05) while the male subjects with the VDR FF (74.0±19.3) and Ff (73.0±16.6) genotypes had a tendency for greater grip strength than the male subjects with ff genotype (69.2±23.3). In the back strength, there was no significant difference between genotypes even though there was a tendency for greater back strength in male and female subjects with FF (67.6±47.3, 46.1±26.1) and Ff (68.6±47.7, 44.3±25.2) genotypes than male and female subjects with ff genotype (56.7±43.1, 34.5±28.9). In addition, we determined there to be a statistically significant difference the genotypic frequency of VDR-FF, Ff, and ff between the general people (n=409, 33.9%, 49.4 %, and 16.7%) and a national elite athletes (n= 540, 40.0 %, 46.5 %, and 13.5 %; p=.037).

Conclusions: According to our results, we concluded that genetic variation in the VDR is correlated with grip muscle strength in females and athletes with the VDR-FF and Ff genotypes might harbor a distinct advantage over athletes with the ff genotype.

Key words: Bone. VDR. Polymorphism. Athlete. Strength.

The type 5 collagen (COL5A1) gene is associated with anterior cruciate ligament injuries

Posthumus M¹, September AV¹, Keegan M¹, O'Cuinneagain D³, Van der Merve W³, Schwellnus MP¹, Collins M^{1,2}

¹UCT/MRC Research Unit for Exercise Science and Sports Medicine of the Department of Human Biology, Faculty of Health Sciences, University of Cape Town; ²South African Medical Research Council, Cape Town, South Africa; ³Sports Science Orthopaedic Clinic, Cape Town, South Africa.

Background: Anterior cruciate ligament (ACL) ruptures have been reported as the most severe injury sustained in a sporting population. A familial predisposition toward rupturing the ACL has been identified, suggesting that genetic factors are implicated in these injuries. The BstUI restriction fragment length polymorphism (RFLP) within the *COL5A1* gene has previously been shown to be associated with Achilles tendinopathies^{1,2}. The *COL5A1* gene encodes for the $\alpha 1$ chain of type V collagen, which is a minor structural component of both tendons and ligaments.

Objectives: To investigate if the *COL5A1* gene is also associated with increased susceptibility to ACL ruptures.

Methods: Eighty two subjects with clinically and surgically diagnosed ACL ruptures, as well as 94 physically active controls subjects (CON) without any history of ACL injury were included in the study. All subjects were genotyped for the BstUI RFLP within the *COL5A1* gene (SNP rs12722).

Results: There was a significant difference (p=0.03) in the genotype frequency between the ACL and CON group. The frequency of the CC genotype was significantly higher in the control group than in the ACL group (24.7% vs 9.76%, odds ratio of 0.3; 95% confidence interval 0.14 to 0.8; P=0.01).

Discussion: The *COL5A1* BstUI RFLP is associated with ACL ruptures. Individuals with a CC genotype are less likely to develop ruptures to the ACL.

References:

1. Mokone GG, Schwellnus MP, Noakes TD, Collins M. The *COL5A1* gene and Achilles tendon pathology. *Scandinavian Journal of Medicine and Science in Sports* 2006;16:19-26.
2. September AV, Cook J, Handley CJ, van der Merwe L, Schwellnus MP, Collins M. Variants within the *COL5A1* gene are associated with Achilles tendinopathy in two populations. *British Journal of Sports Medicine*, In Press.

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

Variants within the metalloproteinase 3 (MMP3) gene are associated with Achilles tendinopathy

Raleigh SM¹, van der Merve L^{4,5}, Ribbans WJ¹, Smith RKW⁶, Schwellnus MP², Collins M^{3,2}

¹Division of Health and Life Sciences, University of Northampton, Northampton, UK; ²MRC/UCT Research Unit for Exercise Science and Sports Medicine of the Department of Human Biology, Fa-

culty of Health Sciences, University of Cape Town, South Africa; ³South African Medical Research Council, Cape Town, South Africa; ⁴Biostatistics Unit, South African Medical Research Council; ⁵Department of Statistics, University of Western Cape, Cape Town, South Africa; ⁶Veterinary Clinical Sciences, Royal Veterinary College, Herts, UK

Objectives: Sequence variation within the *COL5A1* and *TNC* genes are known to associate with Achilles Tendinopathy. In addition to the *TNC* and *COL5A1* genes, it is likely that predisposition to Achilles tendon pathology will be associated with genes that encode proteins with regulatory roles in maintaining extracellular matrix (ECM) homeostasis. Included in this class are the matrix metalloproteinases (MMPs). Reduced levels of *MMP3* mRNA and immunochemically detectable *MMP3* protein have been observed in resected AT tissue compared to control tissue. The aim of this case-control genetic association study was to investigate whether variants within the matrix metalloproteinase 3 (*MMP3*) gene also contributed to both Achilles tendinopathy and Achilles tendon rupture in a Caucasian population.

Methods: One-hundred and fourteen subjects with symptoms of Achilles tendon pathology and 98 healthy controls were genotyped for *MMP3* variants rs679620 (A/G), rs591058 (T/C) and rs650108 (G/A).

Results: As single markers, significant associations were found between the GG genotype of rs679620 (OR=2.5, 95% CI 1.2-4.90, P=0.010), the CC genotype of rs591058 (OR=2.3, 95% CI 1.1-4.50, P=0.023) and the AA genotype of rs650108 (OR=4.9, 95% CI 1.0-24.1, P=0.043) and risk of Achilles tendinopathy. The ATG haplotype (consisting of rs679620, rs591058, and rs650108) was under-represented in the tendinopathy group when compared to the control group (41% vs 53%, P=0.038). No associations were found between any of the *MMP3* markers and Achilles tendon rupture.

Conclusion: Variants within the *MMP3* gene are associated with Achilles tendinopathy. These data further support a genetic contribution to a common sports related pathology.

Key words: Matrix metalloproteinase. Stromelysin 1. Rupture.

Influence of the angiotensin converting enzyme insertion/deletion polymorphism on lactic metabolism during strength training

Cupeiro R¹, Gonzalez-Lamuño D², Amigo T², Alvarez M¹, Morencos E¹, Benito PJ¹

¹Facultad de Ciencias de la Actividad Física y del Deporte. INEF, Universidad Politécnica de Madrid; ²Facultad de Medicina. Universidad de Cantabria

Introduction: Although the Angiotensin Converting Enzyme (ACE) Insertion/Deletion (I/D) polymorphism have been related with many performance parameters, only two studies have associated this polymorphism with the anaerobic metabolism during exercise^{1,2}. Therefore the aim of this study was to investigate the potential influence of the I/D ACE polymorphism on the lactate response to a circuit weight training at high intensity.

Methods: 9 male and 17 female (mean ± standard deviation; 24.2 ± 1.8 years, 178.1 ± 5.9 cm, 78.2 ± 7.9 kg for men; 21.5 ± 2.6 years, 162.7 ± 3.7 cm, 58.8 ± 4.9 kg for women) performed a circuit weight training of 8 exercises. The intensity was set at the 80% of the 15RM. Capillary blood samples were analyzed at the end of each lap using the YSI 1500 SPORT Lactate Analyzer. Maximal lactate increment was calculated for each individual, expressed in percentage of the peak of lactate reached during the study. The I/D polymorphism of ACE gene was determined by polymerase chain reaction. Subjects were divided in 2 groups: I (II homozygotes and ID heterozygotes) and D (DD homozygotes).

Results: The T-test showed significant differences for the maximal lactate increment $t(7) = -7.05$ with $p < 0.001$ only in men, having lower increment the I group (77.7 ± 4%) than the D group (98.6 ± 3.6%). In women, no significant differences were observed, although a trend was observed, having lower increment the I group (86 ± 20.2%) than the D group (92.5 ± 10.7). Percentage of genotypes: DD=77.8%, ID=11.1% and II=11.1% for men. DD=52.9%, ID=35.3% and II=11.8% for women.

Discussion and conclusions: Some studies have shown that the ACE DD genotype may be associated with an impairment in peripheral tissue oxygenation during exercise³. Our results in men are consistent with these studies. However, in women there are no differences for the anaerobic involvement in strength training between I and D groups. This could be explained through the

different energetic metabolism between men and women (higher utilization of lipids⁴, elevated concentration of myocellular triacylglycerides and percentage of type I fibers observed in women^{5,6}, or the different hormone profile⁷). These data suggest that the characteristics of woman body reduce, or even suppress, the influence of the ACE I/D polymorphism in tissue oxygenation during exercise observed in men. However, studies with larger samples are necessary to confirm our results.

References:

1. Liu T, Sun X. *Sheng Wu Yi Xue Gong Cheng Xue Za Zhi* 2006;23:1045-7.
2. Rankinen T, et al. *J Appl Physiol* 2000;88:1029-35.
3. Kanazawa H, et al. *Chest* 2002;121:697-701.
4. Venables MC, et al. *J Appl Physiol* 2005;98:160-7.
5. Steffensen CH, et al. *Am J Physiol Endocrinol Metab* 2002;282:E634-42.
6. Tarnopolsky MA, et al. *Am J Physiol Regul Integr Comp Physiol* 2007;292:R1271-8.
7. D'Eon T, Braun B. *J Womens Health Gend Based Med* 2002;11:225-37.

Key words: I/D ACE polymorphism. Lactic metabolism. Strength training.

HEALTH IMPROVEMENT AND AGING DELAY THROUGH PHYSICAL ACTIVITY - I LANGUAGE: SPANISH

Accelerometer-based activity monitors: description and validation as objective instruments in physical activity assessment related to prevent social sedentary lifestyles

Ruiz Tendero G¹, Salinero Martín JJ², Aznar Laín S³

¹Universidad Católica San Antonio de Murcia; ²Universidad Camilo José Cela; ³Universidad de Castilla-La Mancha

Introduction: The use of technology applied to Health Care has led to the involvement of a quantitative and qualitative step in the progress of physical activity assessment and control. Overweight and sedentary lifestyles are both characteristic of most developed societies, as a consequence, interest in the promotion of physical activity has become a major constituent of overall health promotion strategies. Many researchers have already studied multiple applications of activity monitors as a means to prevent several diseases. The aim of this communication is to review new quantification possibilities for the assessment of physical activity, a variable intimately related to good health. First, a variety of existing instruments are described with regard to their validity and functionality. Then, their applications are analyzed in order to prevent social sedentary lifestyles.

Methods: A total of forty-two papers, six manuals and three congress communications have been deeply analyzed and compared to develop our research subject whose main core is accelerometer technology.

Results and conclusions: Following the basis of our revision and technical specifications compiled directly from the main manufacturer, a comparative table has been developed on which the five most commonly used accelerometers appear. Depending on the model different functions can be used (memory, battery, led, axis mode ...). Accelerometer placement: information analyzed has led us to the conclusion that the hip and lower back areas are the most common placement destinations for activity monitors. Record periods: one-minute epochs are usually programmed, but this measure could not be suitable for children. Three of the spheres of application of accelerometry have been the following: 1) the assessment of the compliance with physical activity guidelines; 2) the assessment of the environmental influence in physical activity and 3) Measurement patterns of physical activity in different samples of population.

Key words: Accelerometer. Physical activity.

Maternal exercise during the third trimester of pregnancy and the fetal heart rate

Barakat R¹, Stirling J¹, Zakynthinaki M², Sampedor J¹

¹Facultad de Ciencias de la Actividad Física y del Deporte-INEF. Universidad Politécnica de Madrid; ²Instituto de Ciencias Matemáticas. CSIC - UAM - UC3M - UCM

Introduction: A substantial amount of research has investigated the influence of physical exercise during pregnancy on certain maternal and foetal parameters. Controversy exists however regarding the foetal heart rate (FHR) during mater-

nal exercise as several investigations have studied this parameter and obtained different results.

Objective: To test the hypothesis that the foetal heart rate (FHR) increases during maternal exercise, performed on a static bicycle during the third trimester. To know if the magnitude of the increase is related to gestational age or parity.

Material and methods: This research involved a collaboration with the Gynaecology and Obstetrics Service of "Severo Ochoa" Hospital (Madrid) and Universidad Politécnica de Madrid. The research committee and the Ethical Commission of the Hospital approved the work. **Sample:** 20 healthy pregnant women were studied, in their last trimester. No women showed any medical complications in their pregnancy or contraindications for the practice of physical exercise. Informed consent was obtained. **Exercise program:** the exercise protocol consisted of rest in the first part, followed by a session of 20 minutes of moderate work (static bicycle exercise) and then rest until the FHR returned to the pre-exercise levels. The clinical history of the pregnant women provided data about medical and personal factors. For the statistical analysis, Pearson correlation and Student's t test for unpaired data were used.

Results: Our results show increases (11 - 36 beats/min, mean=24 beats/min) in FHR in all the studied cases. The gestational age showed no correlation with the increment in FHR (Pearson 0.06). There were larger increments of FHR in secundigravid (mean=152 ± 6.0 beats/min) than in primigravid (mean=147 ± 4.6 beats/min).

Conclusion: Maternal aerobic and moderate exercise practised during the last trimester increments the FHR without harmful effects. These increments do not depend on the maternal age. Parity has an influence on the magnitude of the FHR increment.

Key words: Foetal. Exercise. Pregnancy.

Age influence in sportsmen after strenuous effort over NK cell overall number and activity

Gómez Quevedo L, Rosado Velázquez DC, Da Silva-Grigoletto ME, Peña Martínez J, Lanchó Alonso JL, Lozano Reina JM

University of Córdoba (Spain)

Introduction: In this research we wanted to study the possible changes in blood sample expression of the differentiation molecules CD69 (Natural Killer cells) after maximal strenuous controlled exercise in young adults and old sportsmen.

Methods: 12 amateur sportsmen have been selected. 6 of them were young adults between 21 and 28 years old, and the other 6 were old between 62 and 71 years old. Maximal test was performed (Balke Test) in cycloergometer. Blood tests were as well performed before, during and after the test. Natural Killer (CD3-CD56+) cells were analyzed in blood sample by direct immune fluorescence using anti human CD56 y anti human CD3 (Becton Dickinson, USA). Activation markers were analyzed anti-CD69 (Becton Dickinson) by flux cytometry by FACS Vantage SE (Becton Dickinson).

Results: CD69 are higher in overall Natural Killer cell in young adults than in old sportsmen. It's evidenced a small decrease in young adults as well as in old sportsmen during the test. Furthermore this decrease continues 48 hours after the ending of the test. Old sportsmen show higher CD69 values in Natural Killer cytotoxic cells. Young adults showed smaller levels. It was also seen a small decrease in old sportsmen all along the test. On the contrary, in young adults no variation was reported during the test. CD69 regulators cell showed a similar behaviour in overall CD69 cells.

Conclusions: Activation CD69 markers showed a higher level in young adults than in old sportsmen at a rest situation. On the other hand, in old sportsmen and young adults, overall values in CD69 markers decrease during the test and 48 hours after the test.

Keys words: Sportsmen. CD69. Old.

Effects of exercise and caloric restriction in physical performance in mice

Rodríguez-Bies E, Velázquez A, Navas P, López-Lluch G.

Centro Andaluz de Biología del Desarrollo (CABD), Universidad Pablo de Olavide-CSIC. Carretera de Utrera Km. 1, 41013 Sevilla, Spain

Introduction: Aging is inevitably associated with a progressive loss of muscle and strength. The beneficial effects of regular, aerobic physical exercise on the physical capacity in aged organisms have been known for a long time.

Caloric restriction (CR) also delays aging. Moreover, it has been proved that CR induces similar cellular and molecular changes to the ones observed on animals that underwent regular physical activity. Thus, the present study try to determine if the combination of both, CR and regular exercise increases physical performance in both, young and aged organisms by using mice as animal model.

Material and method: Fifty six young (4 months old) and old (11 months old) male Swiss CD1 mice were divided in four groups: sedentary, AL (Ad libitum fed), CR (under caloric restriction) and trained ALT and CRT respectively. After 4 months under indicated feeding conditions, some animals began aerobic exercise training on treadmill (ALT and CRT). Training consisted of running at a speed of 20 m/min, 20 min/day, 5 day/week, for 10 weeks. After the exercise training program mice were subjected to an strenuous exercise on treadmill. After running, mice were killed by cervical dislocation and samples obtained.

Serum was analysed for level of different metabolites, creatine-kinase (CK) and total antioxidant status (TAS). Lipid peroxidation was determined by MDA (malondialdehyde) measurement's. Gastrocnemius muscle homogenate was used to measure mitochondrial respiratory chain activities.

Results: No changes in body weight were found between groups. Both, young and old mice under CRT conditions showed a greater performance and were able to run longer than the rest of groups. Besides that, the CK activity in serum was decreased in CRT groups indicating a lower muscle damage after running. Moreover, TAS in serum remained higher in CRT young whereas lipid peroxidation was lower indicating a lower oxidative damage. Furthermore, the higher performance of skeletal muscle in CR fed animals was accompanied by higher activity in respiratory complexes of mitochondria indicating a higher capacity for aerobic metabolism.

Conclusion: Our study shown that CRT young and old mice were more resistant than the rest of groups whereas they show lower muscle damage and higher antioxidant capacity. The combination of both, CR and exercise increase the muscle capacity at the same time than increase cellular protection against stress. Thus, our model indicate that the combination of a balanced diet and moderated aerobic exercise can positively affect health during aging at the same time that increase physical performance.

Key words: Aging. Physical performance. Caloric restriction.

Physical activity, anthropometry and other factors related with the health status of Madrid's adolescents

Cordente Martínez CA¹, García Soidán P², Sillero Quintana M¹, Stirling J¹, Monroy A¹.

¹Facultad de Ciencias de la Actividad Física y del Deporte (INEF-Universidad Politécnica de Madrid); ²Facultad de Ciencias Sociales y de la Comunicación (Universidad de Vigo).

Introduction: The aim of our study¹ is to understand the existing relationship between the physical activity level (PAL) and demographical, sociological and anthropometrical factors for the adolescents (13-17 years-old) of Madrid.

Material and methods: After written parental consent the study was done with a sample of 266 boys and 288 girls of 35 educative centers of 16 of the 21 districts of Madrid. The adolescent completed an anonymous survey and were measured using anthropometrical techniques²⁻⁴.

Results: 13.2% of boys and 36.4% girls of the sample were inactive. The socioeconomic status (SES) was a determinant of the girl's PAL (p<0.05). The PAL of boys was significantly related with that of the father (p=0.034) where as the PAL of girls was significantly related with both that of the father (p=0.003), the mother (p=0.007) and the peers (p=0.022). It was founded that girls had a significantly higher (p<0.05) tobacco consumption (TC) than boys. There was an inverse significant relationship (p<0.05) between the TC and PAL amongst boys. The alcohol abuse was significantly (p<0.05) higher in girls. No relation was found between alcohol consumption and PAL. Worrying values were found with respect to screen time (ST) –TV, PC and videogames – amongst boys and subjects of the lower SES. A significant relation (p<0.05) between body adiposity and PAL was found amongst girls.

Conclusions: Girls and lower SES subjects need priority attention with respect to health related habits. The PAL of girls was more influenciabile that the one of boys. Parents, deliberately or not, are one of the most important factors in the habits of their children. The influence, positive or negative, of other factors (media, peers, school...) is filtrated modified by the family. The ST is a relevant variable due to the current proliferation of multimedia entertainment means. To increase

ORAL COMMUNICATIONS

PAL, it would be necessary to provide easier access for adolescents to public sport facilities, especially during the afternoons and nights of the weekends and other vacation periods.

References:

1. Cordente Martínez CA, 2006. Tesis doctoral. <http://www.cafyd.com/tesis12cordente.pdf>
2. Cordente Martínez CA, García Soidán P, Sillero Quintana M, Domínguez Romero J. Relación del nivel de actividad física, presión arterial y adiposidad corporal en adolescentes madrileños. *Rev Esp Salud Pública* 2007;81:307-17.
3. Aragonés MT, Casajús JA, Rodríguez F, Cabañas MD. Protocolo de medidas antropométricas. En: Esparza Ros F, editor. *Manual de Cineantropometría. Monografías FEMEDE*. Madrid: FEMEDE 1993,35-66.
4. Porta J, Galiano D, Tejedo A, González JM. Valoración de la composición corporal. Utopías y realidades. En: Esparza Ros F, editor. *Manual de Cineantropometría. Monografías FEMEDE*. Madrid: FEMEDE 1993;113-70.

Key words: Health. Adolescent.

Adherence in programs of exercise on prescription: a pilot intervention in Catalonia

Aranda S¹, Violán M², González A³, Vallejo L¹, Lloret M¹

¹Institut Nacional d'Educació Física de Catalunya (INEFC). Centre de Barcelona; ²Pla d'Activitat Física Esport i Salut (PAFES). Secretaria General de l'Esport de Catalunya; ³Pla d'Activitat Física Esport i Salut (PAFES). Direcció General de Salut Pública. Departament de Salut

Introduction: Increasing physical activity (PA) is a recognised strategy for the prevention of cardiovascular diseases.

The Physical Activity, Sport and Health Plan (PAFES) is a joined initiative by the health and the sports departments of the Government of Catalonia with the objective to promote more active lifestyle through the prescription of PA by health professionals. PAFES established three levels of PA prescription: general advice, counselled advice and derivation to a supervised exercise program. The supervised exercise program pretended to teach patients how to exercise and the acquiring of an active lifestyle through a specific program.

Many participants who are given an exercise prescription fail to comply with it. Over 50% of participants who begins an exercise program drop out within 6 months.

This study examined the adherence to the program during a pilot intervention, in order to examine if participants acquired an active lifestyle.

Materials and methods: Patients with one or more cardiovascular risk factors (obesity, hypertension, dyslipemia, diabetes or sedentarism) of 20 centres of primary care were included in the program. Health professionals prescribed physical activity to 2337 adult patients, of which 691 were derived to the supervised exercise program. Finally 196 patients participated in the supervised exercise program for at least three months with a mean age of 59.48 (DS 12.57) years.

The supervised program consisted of 60 minutes of moderate-intensity exercise for two days per week for three months.

The demographic data, medical history information and attendance during the program were collected.

The adherence was calculated as the number of sessions completed compared to the number of sessions prescribed. Dropping-outs were included in the analysis.

Results: The intervention adherence rate mean was 85.01%. The 50% of the participants presented adherences rates ranging from 78.4 and 100%, with a median of 90.90%. There was no significant difference for the different types of cardiovascular risk factor (obesity, hypertension, dyslipemia, diabetes and sedentarism).

Conclusions: We found excellent data of adherence to the 3 months program (>85%) throughout the study.

The results of the pilot intervention in Catalonia are positive for the continuation of PA prescription in primary care centres.

Further studies should quantify the post-intervention exercise adherence rates in order to confirm whether PA as a behaviour change occurs in adults with cardiovascular risk factors.

Key words: Adherence. Exercise. Cardiovascular risk factors.

HEALTH IMPROVEMENT AND AGING DELAY THROUGH PHYSICAL ACTIVITY - I

LANGUAGE: ENGLISH

The potential health benefits of training program on body composition and cardio-ventilatory parameters in middle aged obese women

Castres I, Lemaitre F, Tourny-Chollet C. CETAPS EA3832, University of Rouen

Introduction: In France, 12.4% of the population had a body mass index greater than 30 kg.m². It is now widely accepted that the treatment of obesity should be primarily based on weight-loss diets and exercise programs to increase physical fitness and prevent comorbidities. This present study examined the potential health benefits of both training and diet program on body composition and cardio-ventilatory parameters.

Methods: 7 diabetic-obese women (56±6 years) performed a supervised training program, 3 days per week for 12 weeks. Each session comprised: an aerobic training session at ventilatory threshold (20-50 min) and a resistance session (6 exercises, 1-3 sets of 6-12 repetitions without load). A progressive incremental exercise test, ventilatory and anthropometric parameters (weight, height, skinfolds, hip and waist circumferences) were assessed before and after the intervention.

Results: After the 12 weeks training program, lean body mass was increased (49.0±4.5 kg vs 49.9±4.4 kg, p<0.05); while the fat mass decreased (41.4±8.8 vs 40.2±8.9 kg, p<0.05). No body mass change was observed throughout the training program whereas waist circumference and hip circumference decreased (106.9±9.5 vs 101.4±10.8 cm, p<0.05; 123.1±12.3 vs 118.3±14.7 cm, p<0.05, respectively). Thus, this training program induced a reduction in fat mass, in abdominal obesity and muscular gain.

Obese subjects had an excessive metabolic requirement and abnormal cardiovascular responses to exercise: higher $\Delta V_{O_2}/\Delta \text{Work}$ rate (117.62±7.86% of predicted values) and lower $\Delta \text{HR}/\Delta V_{O_2}$ (70.87±5.42% pred). But ventilatory and breathing pattern did not appear to be limiting factor of physical exercise (no difference in $\Delta V_E/\Delta V_{CO_2}$ and $\Delta V_T/\Delta \ln V_E$). After the 12 weeks training program, $\Delta V_{O_2}/\Delta W$ decreased (11.61±0.78 vs 10.63±1.23 ml.min⁻¹.W⁻¹); and O₂ pulse at ventilatory threshold (0.09±0.02 vs 0.10±0.02 ml.min⁻¹.beat⁻¹), VO_{2 peak} (14.27±2.06 vs 16.03±2.54 ml.kg⁻¹.min⁻¹) and VO₂ at ventilatory threshold (10.39±1.94 vs 12.03±2.33 ml.kg⁻¹.min⁻¹) were increased. These changes reflected an improvement of an aerobic work efficiency and O₂ extraction per heart beat.

Conclusion: In conclusion, obese subjects had abnormal metabolic and cardiovascular responses to exercise, decreasing the physical capacity. But ventilation and breathing pattern did not appear to be limiting factors. The aerobic training at ventilatory threshold with resistance exercise without load seems to be suitable for obese subjects. It improved aerobic work training (-8.44%), anaerobic threshold (+15.78%), O₂ pulse at ventilatory threshold (+11.11%) and VO_{2 peak} (+12.33%).

Key words: Physical exercise. Obesity. Ventilatory and cardiovascular responses.

Development and dissemination of a physical activity program down under – the Australian 10,000 steps program

Mummery WK, Hinchliffe A, Joyner K, Davis C
Centre for Social Science Research, CQUniversity Australia

Australia, like many countries in the developed world, has a physical inactivity problem. In an effort to address this issue, researchers and practitioners have been investigating approaches to increase health-related physical activity at the individual and population level. Since 2001, CQUniversity has been home to the development and dissemination of a population-based physical activity promotion project known as the 10,000 Steps program. The program is targeted at individual, workplace and community levels of implementation and, as of abstract submission date, has 15 designated 10,000 Steps communities in Australia, over 62,000 members of the 10,000 Step online community (www.10000steps.org.au)

and more than 2,600 registered program providers who work at implementing the program at the individual, group, workplace and community-level. Built around the individual use of a pedometer and the goal of accumulating 10,000 steps of daily incidental activity, the project uses a social-ecological approach to support and promote activity. The approach requires multiple levels of delivery, ranging from person promotion to environmental change and support for physical activity at the level of municipal and state government.

The presentation will provide a history of the development of the program, originating as a whole-of-community intervention project entitled '10,000 Steps Rockhampton' and an explanation of the dissemination of the project throughout Queensland and across Australia using a variety of social marketing approaches. The discussion will also detail the establishment, benefits and costs of a unique partnership between a commercial provider and a non-profit health promotion project to assist with the sustainability and social marketing of the program.

Key words: Physical activity. Steps program. Health.

Effects of uphill- and downhill-walking during daily life on risk factor of hip fracture

Díaz G, Carrasco M, Martínez M. A, Barriga A, Jiménez, F, Navarro F
Sport Training Laboratory. Faculty of Sport Sciences. Toledo (Spain)

The purpose of this study was to compare the effect of living in a hilly terrain versus living in a flat area on risk factor of hip fracture. It has been shown that walking uphill enhances the load-bearing exercise and reduces the risk factor of hip fracture (Lau, *et al.* 2001). Nevertheless, it is unclear the effect of living in the same city but in different area with different orography. The city of Toledo (Spain) has an orography quite different depending on the area.

Methods: Two hundred ninety-two caucasian women ($56,59 \pm 11,3$ years) were measured using a quantitative ultrasound device at the heel level to assess the risk factor expressed in T-Score. Subjects were divided into uphill group (UG) and flat group (FG) depending on their living areas. A T- student analysis was used to evaluate the differences between both groups.

Results: Mean T-Score value in UG and FG were $-0,40 \pm 1,08$ and $-0,97 \pm 1,33$ respectively. There were no significance differences between groups in the age. ($p = 0,11$). There was a significance difference between groups with regard to mean T-Score value ($p < 0,001$).

Discussion: It has been previously shown that slow walking do not increase bone mineral density (BMD), whereas fast walking can improve BMD (Hatori *et al.* 1994). People usually do not walk as fast as it is required to improve BMD. However, living in an area with up- and down-hills may help to decrease risk factor of hip fracture irrespective of the speed of walking.

Key words: Osteoporosis. Uphill. Elderly.

Age-associated longitudinal change of objectively measured daily physical activity in early seventh decade of life

Ayabe M¹, Yoshitake Y², Tobina T¹, Higuchi H³, Harada T¹, Kimura Y⁴, Miyazaki H⁵, Kiyonaga A¹, Tanaka H¹

¹Fukuoka University; ²National Institute of Fitness and Sports in Kanoya; ³Kyushu University of Health and Welfare; ⁴Saga University; ⁵Niigata University

Objectives: The physical activity is major independent predictor of the incidents of cardiovascular disease, obesity, diabetes as well as the all cause mortality. However, the longitudinal changes of the levels of daily physical activity remain unclear. Thus, the purpose of the present investigation was to examine the Age-associated longitudinal change of objectively measured daily physical activity in early seventh decade of life.

Methods: A total 110 older individuals participated in the present investigation. All subjects were independently living, and were free from any chronic diseases. In seventy-one years old and seventy-three years old, all subjects measured the levels of daily physical activity by means of a valid accelerometer. Subjects wore an accelerometer for seven days continuously, thereafter the amount of calorie expenditure (kcal/day), the number of steps (steps/day), sedentary time (min/day), and the time spent in light, moderate and vigorous intensity physical activity corresponding to < 3 METs (LPA), 3 to 6 METs (MPA), and > 6 METs (VPA), respectively.

Results: In men, we could not find significant difference in all indices of levels of physical activity at two measurements. However, women significantly decreased the time spent in VPA from 71 yr. to 73 yr. ($p < 0,001$), whereas the remaining parameters of levels of physical activity did not differ significantly.

Discussion: The present study firstly shows the age-associated longitudinal change of objectively measured daily physical activity in early seventh decade of life by means of an accelerometer. The results of the present investigation indicate that the older women, at early seventh decades of life, decrease the time spent in vigorous intensity physical activity with increasing age. Therefore, the older individuals should be encouraged to improve the intensity of physical activity rather than the amount of physical activity. Additionally, the aging pattern of physical activity was inconsistent between men and women.

Key words: Accelerometer. Pedometer. Aging. Public health.

Consecutive duration of daily physical activity in older individuals at 80 years old

Ayabe M¹, Yoshitake Y², Tobina T¹, Nakagata T¹, Kimura Y³, Miyazaki H⁴, Kiyonaga A¹, Tanaka H¹

¹Fukuoka University; ²National Institute of Fitness and Sports in Kanoya; ³Saga University; ⁴Niigata University

Objectives: Active lifestyle elicits the numerous health benefits, such as improving physical fitness levels, the decrease the risk of diabetes, obesity, hypertension, diabetes as well as the all-cause mortality. Recent technological advances enable the objective assessment the consecutive duration of physical activity in addition to the amount and intensity of physical activity. Although previous findings indicated that the consecutive duration of daily physical activity associated with the obesity and the levels of aerobic capacity, the consecutive duration of daily physical activity in older individuals remains unclear. Thus the purpose of the present investigation was to appear the consecutive duration of daily physical activity in older individuals at 80 years old.

Methods: A total 240 older individuals, aged 80 yr., participated in the present investigation. All subjects were independently living, and were free from any chronic diseases. All subjects measured the levels of daily physical activity by means of a valid accelerometer. Subjects wore an accelerometer for seven days continuously, thereafter the amount of calorie expenditure (kcal/day), the number of steps (steps/day), sedentary time (min/day), and the time spent in light, moderate and vigorous intensity physical activity corresponding to < 3 METs (LPA), 3 to 6 METs (MPA), and > 6 METs (VPA), respectively. Additionally, the physical activity was divided according to the consecutive duration of physical activity (< 4 sec, 4 to 8 sec, 12 to 16 sec, 20 to 32 sec, 36 to 60 sec, 64 to 180 sec, 184 to 600 sec, > 600 sec), and the frequency of physical activity at consecutive duration was obtained.

Results: Of the total physical activity, 80% of physical activity categorized to < 30 sec of consecutive duration. Furthermore, the daily frequency of the physical activity categorized to > 600 sec was below < 1 bounds/day.

Discussion: The present study firstly shows the consecutive duration of daily physical activity older individuals at age 80 years. The results of the present investigation indicate that the consecutive duration of most of daily physical activity was shorter than 30 sec, and there is little consecutive physical activity for longer than 10 min, which recommended in the several consensus statements in order to obtain the numerous health benefits, in individuals at 80 years of age.

Key words: Accelerometer. Pedometer. Aging. Public health.

HEALTH IMPROVEMENT AND AGING DELAY THROUGH PHYSICAL ACTIVITY-II LANGUAGE: ENGLISH

The effect of water exercise on strength and hip risk fracture in postmenopausal women

Carrasco M¹, Díaz G¹, Jiménez F¹, Barriga A¹, Muñoz VE¹, Navarro F¹, Vaquero M²

¹Facultad de Ciencias del Deporte. Toledo. España; ²Facultad de Enfermería. Córdoba. España.

Introduction: Postmenopausal process is related to physiological changes who negatively affect physical condition in women. Some of these changes interfere

ORAL COMMUNICATIONS

with muscular strength and bone mineral density. Both factors are determinants when it comes to have a fall because of the related risk of having an osteoporotic fracture. Hip fractures are suffered by 16% of worldwide postmenopausal women and lead the worst consequences for health and quality of life, being frequently a cause of death.

Material and method: A sample of 95 postmenopausal women with moderate risk of hip fracture aged 57±6,69 years were randomly assigned to a swimming (SG) (n=29), calisthenics and resistance (RG) (n=36), and control (CG) (n=30) group.

The SG training consisted of swimming activities in a deep pool and the RG training consisted of rhythmic lower-body impact and upper-body strength-endurance exercises in a shallow pool. Both programs were practiced by 2 years. Maximal biokinetic shoulder peak torque in extension and adduction (FPMp, FPMs) and shoulder resistance torque in flex-extension (FR) were measured by Biometer Swim Bench. Vertical jump height was measured by Ergo-Jump Bosco System (CS). Hip risk fracture was assessed by a calcaneus ultrasonograph Aquiles Express 2000.

Results: Both in SG and RG groups the training effect was significant in FR, being SG values (31,47±3,97N) better than RG (26,19±5,61N) and CG (26,13±3,83N) ones. SG group also found a significant increase in CS. Hip risk fracture significantly increased in RG and CG groups while it was maintained in SG group. Differences in hip risk fracture between SG (-1,68±0,9g/cm²) and CG (-2,46±0,65g/cm²) groups were significant.

Conclusion: The swimming program is efficient for improving upper and lower-body strength. Moreover it seems to maintain the risk of hip fractures. On the other hand, strength increases don't guarantee a less risk of hip fractures.

Key words: Women. Water. Strength. Fracture.

Cardiorespiratory fitness attenuate the health risks associated with obesity in adolescents

Ramírez-Lechuga J¹, Femia P², Som A¹, Muros JJ³, Sánchez-Muñoz C¹, Zabala M¹

¹Departamento de Educación Física y Deportiva. Facultad de Ciencias de la AF y Deporte. Universidad de Granada; ²Departamento de Bioestadística. Facultad de Medicina. Universidad de Granada; ³Departamento de Nutrición y Bromatología. Universidad de Granada.

Introduction: The purpose of this study was to examine differences in body composition measures across three cross-tabulated groups of cardiorespiratory fitness (CRF) in adolescents.

Methods: A total of 183 adolescents (116 boys and 67 girls) aged 16-18 years participated in the study. Participants were cross-tabulated into three groups (HIGH, MODERATE and LOW CRF) using maximal oxygen consumption (VO₂max) to split the groups. VO₂max was measured using a portable gas analyzer (K4b², Cosmed) during the 20 m Shuttle Run Test. Body composition was established by the sum of skinfolds (SS) in millimeters (triceps, subscapular, suprailliac, supraspinal, abdominal y thigh), body mass index (BMI, weight/height²) in kilograms per meters squared and body fat percentage (%BF) estimated using the Siri's equation. Means were compared using the ANOVA test.

Results: Significant differences across groups were observed for SS (P<0.001), BMI (P<0.001) and %BF (P<0.001), in males and females. The HIGH CRF group had significantly lower SS, BMI and %BF compared with the LOW CRF and MODERATE CRF groups, in boys and girls. For both genders, CRF was negatively associated with SS, BMI and %BF, the correlation being more strongly associated with SS (r=-0.68 for boys, r=-0.65 for girls) than with BMI (r=-0.56 for boys, r=-0.53 for girls).

Conclusions: These results suggest that CRF attenuate the health risks associated with fatness. Also, SS seems to be more suitable than BMI to express body fat in this population. Consequently, regular aerobic physical activity should be considered as a very important instrument for the prevention and reduction of obesity-related health risks in adolescents.

Key words: Cardiorespiratory fitness. Obesity. Adolescents.

Parental behavior in relation to physical activity and psychosocial profile in 11-18 aged spanish girls

Molinero O, Martínez R, Bragança M, Salguero A, Márquez S

Facultad de Ciencias de la Actividad Física y del Deporte Universidad de León (España)

Introduction: Spanish girls are at increased risk for becoming overweight. Increased physical activity may prevent this. Parental role is a gatekeeper of access to physical activity and sport facilities in childhood and youth, and it influence can determine participation, adhesion and withdrawal for girls. This behavior can influence girls' health habits (overweight, obesity) and personality development. This study examines measurements of social desirability, perceived physical activity and self-esteem and associations with parent's physical activity, support and social characteristics.

Material and methods: 198 girls aged to 11-18 years participated in this study. They completed the Rosenberg Self-esteem Scale (RSE; 1965), Ryckman Physical Self-Efficacy Scale (PPA; 1982), and Reynolds Social Desirability Scale (RSDS, 1982), and a socio-demographic questionnaire about health behaviors and parents role. The resulting data were treated by means of the statistical package SPSS 15.0 (Chicago, US), a descriptive statistic and Pearson's Correlations with Bonferroni correction were performed.

Results: After statistical analysis, non-sedentary girls showed a special profile: plays with her father (.148**, p=.001), brother/sister (.176*, p=.013) and best friend (.205**, p=.004); is cheered up by them (.213**, p=.003; .168*, p=.018; .266**, p=.000); also they practice physical activity to have fun (.214**, p=.002); be healthy (.222**, p=.002), and social desirability level (.173*, p=.015) scored significantly higher than in sedentary girls. No significant differences in perceived physical activity and self-esteem were observed between both groups.

Conclusions: Father and peers physical activity and support for the practice are factors that influence physical activity in 11-18 aged girls, and consequently influence reasons for sport participation and psychosocial aspects such as social desirability. Mother behavior has not an important influence on girls activity, against expected. Finally, physical activity appears to have no influence on self-esteem and perceived physical activity.

Financiado por la Acción Estratégica sobre el Deporte, Plan Nacional I+D+i; con la colaboración del Instituto de la Mujer.

References:

- Reynolds WM. Development of a reliable and valid short form of the Marlowe-Crowne Social Desirability Scale. *J Clin Psychol* 1982;38:119-125.
- Rosenberg, M. *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press, 1965.
- Ryckman RM, Robbins MA, Thornton B, Cantrell P. Development and validation of a Physical Self-Efficacy Scale. *J Personal Social Psychol* 1982;42:891-900.

Key words: Girls. Physical activity. Parents.

Effect of caloric restriction and aerobic exercise on oxidant stress in plasma of young mice

Lara E¹, Berral FJ², Komanovski A¹, Aldape Y¹, López G², Navas P²

¹Instituto Politécnico Nacional. Escuela Superior de Medicina. Sección Estudios de Postgrado e Investigación. México DF; ²Universidad Pablo de Olavide. Facultad del Deporte. Departamento de Deporte e Informática. Sevilla, España

Introduction: The aim of this work was to determine if caloric restriction and moderate intensity exercise have a similar on the state of oxidation, the antioxidant capacity and some biochemical blood variables related to oxidative stress when the later condition is caused by an episode of acute exercise.

Materials and methods: 28 male Balb C mice were randomized into seven groups (n=4). The first group (ALC) and its control (ALT) were fed *ad libitum*; the second group (RC) and its control (RCT) were fed every other day; the third group (EAM) and its control (EAMT) were fed *ad libitum* and swam one hour three times a week. The seventh group (AL/2), consisted of 2 months old mice and was the basal group; therefore, there was not any intervention before sacrifice. Groups ALC, RC and EAM were given 5.5 hours of swimming at six months of age and were sacrificed immediately afterwards. Groups ALT, RCT and EAMT were sacrificed at the same age, but without the 5.5 hour swimming session. After being sacrificed, blood was extracted from all mice by direct cardiac puncture and the following factors were determined in serum: state of oxidation (TBAR), antioxidant capacity (TBAR-VP), superoxide dismutase (SOD) activity, glutathione peroxidase (GPX) activity, creatinase (CK) activity, and the concentrations of glucose, lactate, triglycerides, total cholesterol, urea, globulins, albumin and total proteins.

Results: Significant differences were found between the experimental groups (ALC, RC, and EAM) and their controls (ALT, RCT and EAMT) in the values of following variables: glucose, triglycerides, urea, globulins, lactate, SOD and

TBAR-VP. However, significant differences were not found between the experimental groups in any measured variable.

Conclusions: It appears that mice with a reduced intake of calories generate a similar antioxidant response as trained swimmer mice when facing an episode of acute stress.

Key words: Ageing. Oxidation. Stress.

Effects of resistance training on body composition and muscle strength in older women

Brito J^{1,2,3}, Fernandes R^{1,2,3}, Louro H^{1,2,3}, Conceição A^{1,3}

¹Escola Superior de Desporto, Instituto Politécnico de Santarém, Portugal; ²Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano, Vila Real, Portugal; ³Laboratório de Investigação em Desporto – Escola Superior de Desporto de Rio Maior

Introduction: The purpose of this study was to compare the effects of low intensity resistance training (LRT) and high intensity resistance training (HRT) on body composition and muscle strength in twenty-eight active postmenopausal older women.

Methods: Participants aged 59-75 years (mean age 66,9 ± 4,69 yr., mean height 152,7 ± 5,85 cm, mean weight 63,2 ± 7,44, postmenopausal years 19,1 ± 7,2), were matched on initial total bone mineral density and assigned on the ABBA procedure. The LRT group (n=9) performed the training at an intensity of 60% of one repetition maximum (1RM), and the HRT group (n=7) at 80% of 1RM. Both groups performed 2 sets per exercise, 8 exercises per session, twice a week, during 7 months. The control group (n=12) maintained calisthenics exercise for 2 sessions a week. Pre and post tests of 1RM were conducted at progressive resistance equipment, muscle strength was measured in a Cybex II isokinetic dynamometer, namely, peak torque of the non-dominant knee and elbow extensors and flexors at 60°.s⁻¹. Measurements of lean body mass (LBM) and fat mass (FM) were made by dual-energy X-ray absorptiometry (DXA, model QDR-1500, Hologic Inc., Waltman, MA).

Results: The results are expressed (Table 1) by the determinations of the regression coefficients for the initial value of each variable, the partial regression coefficient, determination coefficient for the initial value and incremental determination coefficient for the years after-menopause and group, using as dependents variables the final values of the weight, lean body mass (LBM), percentage of the fat mass (FM%), isokinetic force and isotonic force.

Conclusions: Although there were no significantly statistics results, the data indicate substantial increases in strength of knee extension and elbow flexion in the HRT group, and on the arms LBM in the LRT group. These results call for further research to determine the optimal training prescription for obtaining strength gains in older women.

Table 1. Brito J

	Initial value		Years After-menopause		Group control/exercise	
	β	R ² (%)	β	iR ² (%)	β	iR ² (%)
Weight (g)	0,961*	92,3*	-0,014	1,7*	0,043	0,2
LBM (g)						
Total	0,949*	90,1*	-0,041	0,2	0,005	0,0
Arms	0,870*	75,5*	-0,044	0,2	-0,159	2,5
Legs	0,916*	83,9*	-0,049	0,2	-0,023	0,1
FM (%)						
Arms	0,923*	81,1*	-0,013	0,0	0,115	1,3
Legs	0,948*	89,9*	0,043	0,2	0,014	0,0
Isokinetic Force						
Peak torque (Nm)						
Knee Ext.	0,816*	66,6*	0,027	0,1	0,231	4,5
Elbow Ext.	0,670*	44,9*	0,324*	9,6*	0,043	0,1
Isotonic Force						
1RM (Kg)						
Leg Ext.	-0,061	0,4	-0,062	0,4	0,143	1,9
Elbow Flex.	0,062	0,4	-0,077	0,6	0,227	4,9

Key words: Postmenopausal women. Strength training. Muscle strength. Lean body mass. Fat mass.

IMAGING DIAGNOSTICS IN SPORTS MEDICINE-I LANGUAGE: SPANISH

Technique for gadolinium injection through a posterior approach in shoulder arthro-MRI

Gómez S, Arriaza R, Couceiro G, Fernández J, Cantos B
Hospital USP Santa Teresa. La Coruña, Spain.

Introduction: Shoulder arthro- MRI is a very useful diagnostic study for some sports relate to shoulder conditions that could be performed through posterior and anterior approaches. It must be done following a very strict technique, and very few diagnostic centers perform it routinely.

Material and Methods: In our center, we have performed more than 400 shoulder arthro-MRIs through a posterior approach, following the same anatomical references used for shoulder arthroscopy without noticeable complications. The method and references are shown to facilitate radiologists, sports medicine specialists and orthopaedics surgeons the intrarticular injection of gadolinium into the shoulder with minimum patient's discomfort.

Conclusions: When properly performed, posterior approach of the shoulder joint allows the intraarticular gadolinium injection in an easy and reproducible way without the use of sophisticated needle-guidance systems.

Key words: Shoulder arthro-MRI. Technique. Shoulder joint injection.

Usefulness of the ultrasonography in diagnosis, control and follow-up of injuries that affect cortical bone

Porcar C¹, Til L¹, Turmo A¹, Bellver M¹, Martínez R¹, Pomés T¹, Bofill A², Guerra M²

¹Consorci Sanitari de Terrassa - Centre d'Alt Rendiment Esportiu; ²Universitat Ramón Llull

Introduction: Muscle-skeletal ultrasonography has an undoubted usefulness in the diagnosis of the injuries that affect connective tissues of the locomotor system (tendon, muscle, ligament).

Material and methods: In our daily clinical practice, the physical examination is well complemented by a muscle skeletal ultrasounds test.

Results and conclusions: This can be seen in the following pathologies:

- Booting bone, mostly in small joints.
- Rib fractures.
- Altered tendinous insertions, chronic or acute.
- Osteosynthesis material location or displacement.
- Reactions of stress bone (periosteal reactivity)
- Periarticular calcifications.
- Consolidation bone calluses monitoring.
- Articular bone spurs.

Key words: Ultrasonography. Bone lesion. Muscle-skeletal.

Utility of the 3 dimensions ultrasound scan in the study of the tendons ruptures

Jiménez F¹, Mendizabal S¹, Rubio JA¹, Ramos D¹, Moreno R¹, Goitz H², Bouffard A²

¹Sports Central Investigation Unit. Sport Sciences Faculty. Castilla la Mancha University. Toledo. Spain; ²Henry Ford Health System.

Introduction: To improve the precision in the diagnosis of the tendon injuries in the sport, new technological applications of the ultrasound are in use like it is the study in 3 dimensions (3D). One distinguishes in this study the differences obtained in the visualization of the partial tendon ruptures from the quadriceps, with two ultrasonic technologies like it is the ultrasound scan in mode B (2 dimensions) and the three-dimensional study (3D), describing the differences in the images obtained with each of these types.

Materials and methods: There uses an equipment GE, model Logiq e, that is a compact device that includes technological innovations in a portable model as the

ORAL COMMUNICATIONS

system convex virtually and the image in 3D. With this application, there is realized a transverse sweep that a bucket or volume of ultrasound image, that later it is possible to enter and visualize any plane for the study of the different structures. To acquire the images we use a linear transducer multifrequency from 6 to 13 Megahertz of 25mm and develop the method "Free-Hand" that it consists of realizing during the apprehension, a movement of uniform sweep, to hand, with the transducer.

Results: In the cases of tendon rupture, the 3D ultrasound allows to define the extent and the degree of injury needing the definitive treatment. In mode B, there demonstrates the integrity of certain number of tendon fibers, which it leads to the diagnosis of partial rupture. Nevertheless using the application 3D, we obtain an image of the bucket that allows to observe simultaneously the different planes of the torn tendon. This way there is verified that the break in certain zones is complete, so that the liquid content of the recess suprapatellar spreads and reports with the tendon space. These results express to themselves in the Table 1.

Table 1. Jiménez F.

Aplicación	Infiltr. Receso	Tamaño Lesion	Forma	Bordes	Visualización Global
Modo B	++	++	++	++	++
3D	+++	+++	+++	+++	+++

Conclusions: With the 3D application integrated to the portable equipments ultrasound, is evident the best visualization of the tendons ruptures, specifying the diagnosis of partial or complete rupture. In this communication it is a question of demonstrating, the improvement of the indicators and quantitative parameters of quality of the image in tendons ruptures using the ultrasound scan in 3D.

Key words: Tendinopathy. Ultrasound. Three-dimensional.

KINANTHROPOMETRY-I LANGUAGE: SPANISH

Estimation of skeletal muscle mass by fat-free mass index in males athletes

Canda A, De la Torre A, Heras E, Higuera S, Pancorbo A

Sports medicine centre. General sub-directorate of sport and health. High council for sport's. Madrid

The determination of skeletal muscle is important element in the control of training during the season. The body mass index (BMI) is not a valid measure for athletes, since not difference between fat mass and lean body mass, which is why other indexes have been proposed which can measure the lean or fat-free component. The purpose of study was to determine reference values for fat-free mass per unit height (FFM/H, Kg/m²),

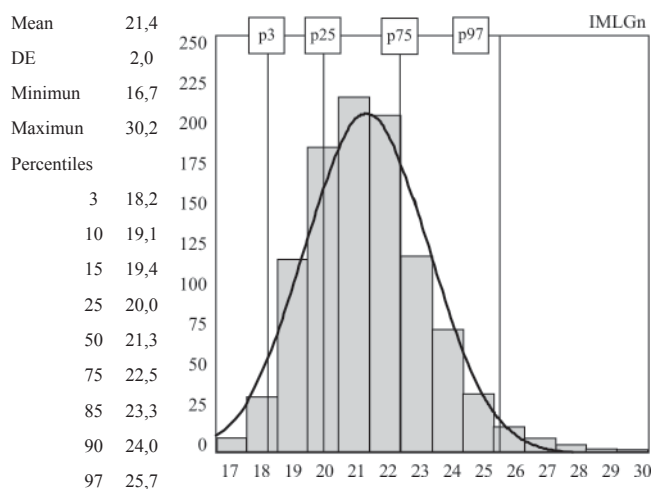


Figure 1. Canda A, et al.

The subjects used were 1020 elite males athletes, aged 18-40 years, who were measured according to standardized procedures of ISAK (International Society for the Advancement of Kinanthropometry). The variables included: weight, height and six skinfolds (chest, ilium, abdominal, triceps, scapula and front thigh). Firstly the fat mass is estimated based on the equation of Jackson (1994), and then fat-free mass is derived by subtracting body fat from body weight. The fat-free mass index (FFMI) was then calculated as follows: (fat free mass/height²) and normalized by a correctional factor: + 6,1 *(1,8 - Height) (Kouri, 1995).

The results are shown in Table 1 and Figure 1.

The present study assessed the degree of variability of FFMI in males athletes. For sporting persons, values were highest for those in weightlifting, throwing, rugby, judo and gymnastics. While lesser values were found for basketball and volleyball players, and track and field athletes.

Our data are consistent with those of Kouri, *et al.* (1995) and Gruber, *et al.* (2000) which set an upper limit of muscularity as a value equal to or greater than 25.

The FFMI could be useful for calculating the relative muscle hypertrophy in sports persons and also for the estimation of optimum body weight.

Key words: Lean body mass. Body composition. Sports.

Body composition in infant haemophiliacs aged 8 to 14 years with low physical activity

Casaña J¹, Pardo A, Benavent J¹, Madera X¹, Garcia C³

¹Department of Physical Education and Sport. University of Valencia. Spain; ²Department of Physical Education and Sport. Catholic University of Valencia. Spain; ³Department of Physiotherapy. University of Valencia. Spain

Introduction: The aim of substitution therapy is to accomplish suitable coagulation factor levels in haemophiliacs. This process encompasses different formats in which the amount of the factor required for each subject is established by considering certain reference criteria, e.g., type of trouble and body weight. Body weight is controlled by haematologists to administer the right coagulation factor dose that may vary according to abnormal or overweight values, which means having to administer larger amounts of this factor. This increase in weight (particularly %MG) above what is normal highly relates to the subjects' inactivity. The aims of this study were to know the body weight of haemophiliacs of prepubertal ages and to compare these values with subject groups of the same age from the healthy population who practices sport.

Material and methods: The participants in this study were 26 haemophiliacs aged 8-12 with different types of treatment; 9 inactive healthy subjects aged 9-14, and 72 subjects aged 8-14 who practiced sport. Body weight values were obtained with the formulae and regression equations used by the National Sports Council with the data obtained from the body weight, height, skin folds, perimeters and bone diameter measurements taken. For this study, the following variables were determined: Height, Weight, BMI, ΣSFOLD, %BM (bone mass), %MG (fat content), %MM (muscle mass) and %FFM (fat-free mass). An ANOVA was done to establish means differences among the different populations analysed.

Results: Haemophiliacs present the highest anthropometric parameter, BMI, body weight and %MG values ($p < 0.05$), and are similar to those of the general sedentary population ($p > 0.05$). Those values of children who practiced sport (swimming and football) were noticeably lower ($p < 0.05$), and the MM and MLG are higher ($p < 0.05$) than those recorded in our haemophilic population.

Conclusions: The body composition components among haemophiliacs of prepubertal ages do not differ so much from those of healthy sedentary children of the same age group. However, the values of our target population are significantly higher than those of children of the same age who do physical exercise regularly. Therefore, physical activity at these ages is recommended to maintain ideal levels of fat content and muscle mass for both haemophilic and sedentary populations to avoid being overweight in the future, which means having to administer larger amounts of coagulation factor medicines.

Key words: Body composition. BMI. Haemophilia. Children.

Analysis anthropometric of the somatotype in patients with sharp heart attack of myocardium of under risk submitted to a program of physical rehabilitation

Cabañas MD¹, Barca J², Abelló V³, Barrado J³, Fuentes JP¹, Díaz C¹, Martín A⁴

¹Universidad Complutense de Madrid. Colaborador del Grupo de Rehabilitación Cardiovascular de la U. Extremadura; ²Universidad de Extremadura. Grupo de Rehabilitación Cardiovascular; ³Hospital San Pedro de Alcántara de Cáceres. Grupo de Rehabilitación Cardiovascular; ⁴Centro de Medicina Deportiva de Cáceres. Grupo de Rehabilitación Cardiovascular

Background: The number of patients included in cardiac rehabilitation programs (CR) does not appear to be high and the benefits of exercise in preventing cardiovascular and CR seem to be clear. The aim of this study was to assess the effects of a programme of RC in Phase II, comprehensive and monitored through the game of tennis as physical exercise, and changes in body composition parameters that are involved in the risk Cardiovascular (CVR).

Methods: 17 men infarction patients an average age of 53 ± 6.4 years, completed a programme of CR for 10 weeks. Weight, height, body mass index (BMI), waist circumference (WC), waist hip ratio (WHR), the sum of 8 skin folds (Σ 8), body fat (BF)%, somatotype, with distances somatipo index dispersion of somatotype (SDI), and somatotype attitudinal mean (SAM) were analyzed and compared before and after the program.

Results: Weight (83.7 ± 10.6 vs. 81.4 ± 9 kg.; p = 0,051), Hight (169 ± 0.05 cm.), BMI (29.2 ± 2.9 vs. 28.4 ± 2.4 Kg./m²; p = 0.053), WC (99 ± 7.6 vs. 96 ± 6.2 cm.; p <0.05); WHR (0.99 ± 0.05 vs. 0.97 ± 0, 05; p <0.05), Σ 8 (145.9 ± 22.6 vs. 137.1 ± 26.7; p <0.05), BF% (29 ± 3.6 vs. 27.5 ± 4; p < 0.05); endomorphic (5.2 ± 1.07 vs. 4.8 ± 1.09; p <0.05), mesomorphic (6 ± 1.16 vs. 6.2 ± 1.08; p <0.05), ectomorphic (0, 4 ± 0.51 vs. 0.5 ± 0.47; p = 0,414), SAM (0.85 ± 0.4; <1)), SDI (1.4 ± 0.6; <2).

Conclusions: Patients who have carried out a programme of CR experienced significant improvements in some anthropometric variables indicator of obesity and increased cardiovascular risk, such as the WC, the WHR, Σ8, and BF%. There is a significant improvement in the endomorphic and mesomorphic. However the SAM and SDI do not reach a significant difference, indicating a relative homogeneity of the group before and after, and that requires strategies to deepen greatest differences.

Key words: Anthropometry. Cardiac rehabilitation tennis.

Anthropometric dates of two pretty similar exotic style of wrestling: Ssirum vs Canarian wrestling

Marrero-Gordillo N¹, Sunghan Park², González-Brito A¹, Clavijo-Redondo A¹, Diaz-Armas JT³, Hernández-Álvarez A¹, Castañeyra-Perdomo A¹

¹Center for Sport Science Studies; University of La Laguna, Tenerife, Spain ²Department of Human Physiology, Choi Youngwoong University, South Korea; ³Physical Education Teacher.

Introduction: In the world of wrestling there are some stiles that are more known than others, but those “others” could be more numerous even than the first one. Ones and another’s are so old as the Man is, and the bodies of those suffering men have to shown the clues of such kind of sport according to each style. In this case we show anthropometrics dates from two so distant modalities, but which, in this occasion, have become to cross their ways through the geographical distance.

Material and methods: Eighteen wrestlers from the Korean style (Ssirum) belonged to the university league, were studied using the anthropometric method, during an international championship celebrated in South Korea. On the other side, 257 wrestlers from the Canarian style were measured. Both styles were compared.

Results: Table 1.

Conclusions: As we can see in our results, the group of classified Canarian wrestlers was heavier and taller than the group of Korean wrestlers, which was younger. And the opposite happened to the non-classified group of Canarian wrestlers versus Koreans, which was this time only slightly younger. In term of body mass index and fat, the higher level was shown for Canarian wrestler classified group. Somatotype of three groups was the same, but at different level, showing classified group of Canarian wrestler the higher value for mesomorphic component.

Key words: Canarian wrestling. Anthropometrics. Ssirum.

Elite rhythmic gymnasts performance in relation to anthropometric, nutritional, biomechanical and technical aspects

Grande Rodríguez Ignacio¹, Figueroa Achapar Joaquín¹, Hontoria Galán Mónica¹, Cámara Hurtado Montaña², Fernández Ruiz Virginia², Bautista Reyes Ana³

¹Universidad Alfonso X El Sabio; ²Universidad Complutense de Madrid; ³Real Federación Española de Gimnasia

Most of studies about rhythmic gymnastics have been focused on punctual measurements or evaluations as biological and biomechanical variables (Dyhre-Poulsen, 1987; Kulka, 1994), as well as the complex execution of movements made by gymnasts or the effect of high intensity training program at growing period (Georgopoulos, *et al.*, 2001). In this work we propose an integrated longitudinal and applied study, of elite female rhythmic gymnasts, combining biological, biomechanical and nutritional evaluations with the judge’s measurements about gymnast’s executions. This is a longitudinal study carried out during the Olympic Games preparation program. Different measures had been taken along the training period to analyze the evolution and modification of the different parameters as a result of high level training.

Biomechanical parameters evaluated were principal explosive force test variables (Height (cm) and Power (W/Kg)). Biological evaluation included all the anthropometric parameters. Nutritional status of gymnasts had been evaluated by body mass index (BMI), food and calories intake, correlated with biological markers. Technical evaluation was based on judges punctuation related to difficulty degree and performance.

The knowledge obtained will help to select which are the variables with more influence on the real performance in order to optimize the training and control process to improve gymnast competition level.

References:

- Dyhre-Poulsen P. An analysis of split leaps and gymnastic skill by physiological recordings. *European Journal of Applied Physiology and Occupational Physiology*, 1987;56(4):390-7.
- Georgopoulos NA, Markou KB, Theodoropoulou A, Vagenakis GA, Benardot D, Leglise M, Dimopoulos JCA, Vagenakis AG. Height Velocity and Skeletal Maturation in Elite Female Rhythmic Gymnasts. *The Journal of Clinical Endocrinology & Metabolism* 2001;86(11):5159-64.
- Kulka E. Détection-Sélection-Évaluation et Orientation sportive en GRS. *Technique*, 1994;8:28-31.

Investigación subvencionada por el Consejo Superior de Deporte (06/UPR10/08).

Key words: Elite rhythmic gymnasts. Performance. Anthropometry. Nutrition. Biomechanics.

Tabla 1. Marrero-Gordillo N, *et al.*

	Age	Weight (kg)	Height (cm)	BMI	SOMATOTYPE			%Fat	%Muscle	%Bone	%Residual	FFM
					Endo	Meso	Ecto					
Average	21,2 (1,4)	116,1 (32,3)	181,8 (8,1)	34,8 (8,1)	6	8	0,5	23,4 (8,1)	40,9 (6,3)	11,7 (2,1)	24,1	86,6 (15,2)
					SOMATOTYPE							
	Age	Weight (kg)	Height (cm)	BMI	Endo	Meso	Ecto	%Fat	%Muscle	%Bone	%Residual	FFM
Clas.	28,1 (4,1)	126,9 (19,4)	184,4 (5,9)	37,34 (5,29)	5,9	8,9	0,1	24,6 (6,9)				
Non Clas.	22,8 (5,3)	97,4 (18,5)	177, 1 (6,1)	30,9 (5,4)	3,9	6,1	1,02	19,4 (7,3)				

KINANTHROPOMETRY-I LANGUAGE: ENGLISH

Body mass index as a tool for assessing overweight in a military population

Havenetidis K¹, Kardaris D¹, Milias GA², Paxinos T¹

¹Faculty of Physical and Cultural Education, Hellenic Military Academy, Greece; ²Department of Science of Nutrition-Dietetics, Harokopio University of Athens, Greece

Introduction: In Military Academies, anthropometric criteria are used for the detection of somatic deficiencies, which could be evolved to significant drawbacks regarding successful completion of future military training activities. Body Mass Index (BMI) has been traditionally one of these criteria. However, other clinical criteria such as Body Fat percentage (BFP) and Body Fat Mass Index (BFMI) are also considered essential, especially for body adiposity evaluation. The aim of this study was to examine whether these criteria result in comparable estimation of the number of cadets needing nutritional or/and exercise intervention.

Methods: A total number of 971 cadets (885 males and 86 females) all following the standardised exercise and dietary program quoted in the curriculum of the Hellenic Military Academy, participated in the present study. Body mass and height were measured using a balance beam scale equipped with a stadiometer. BMI was calculated as body mass in kilograms divided by height in meters squared, whilst BFMI as fat mass in kilograms divided by height in meters squared. BFP was assessed using bioelectrical impedance and used as the criterion in Receiver Operator Characteristic (ROC) analysis.

Results: After categorization, the percentage values for the underweight category were 0.5% (n=6), 6.7% (n=66) and 15.5% (n=152) for BMI, BFP, BMFI accordingly, with the BMI representing the lowest percentage. Alternatively, for the overweight category BMI compared to the other criteria, identified the highest percentage of cadets for whom treatment would be recommended 28%; n=273, 20%; n=195 and 10.8%; n=105 for BMI, BFP and BMFI respectively. Agreement amongst the criteria existed only for the cadets classified in the normal category [69.5% (n=680), 71.6% (n=701) and 72.2% (n=707) for BMI, BFP and BMFI respectively. ROC analysis showed that for BMI, sensitivity was high in men (0.76) and low in women (0.50). Specificity was high in both men and women (0.83 and 0.95 respectively). For BMFI sensitivity was low both in men (0.31) and women (0.04). Alternatively, specificity reached the highest value both for men and women (1.00). However, with the established BMFI cut-off points for overweight of 3.7 kg/m² for men and 5.1 kg/m² for women, sensitivity was substantially improved to 0.96 and 1.00 accordingly. This improvement was greater than the one observed for BMI (0.85 and 0.73 accordingly) using the respective established BMI cut-off points for overweight of 24.4 kg/m² for men and 24.4 kg/m² for women.

Conclusions: BMI alone may lead to unfortunate misclassifications and disqualifications, when classifying fitness in men and women cadets. The present results also support the need for different BMI classifications of overweight in this sample group as well as the selection of BMFI and BFP as tools for obesity detection.

Key words: Body Mass Index. Clinical criteria. Military.

Body composition of young basketball players measured by bioelectrical impedance (BIA)

Stefanovic Milica, Oblakovic-Babic Jelena, Radivojevic Nenad, Suzic Jelena, Dikic Nenad

Vita Maxima Clinic, Sport Medicine Association of Serbia, Belgrade, Serbia

Objectives: The aims of the study were to present body composition parameters of young male competitive basketball players and to show the differences in respected age groups.

Methods: A total of 52 male basketball players were divided into three groups according to the age; group under 14 (13.8±0.4), group under 16 (15.5±0.5) and group under 18 (17.3±0.5). Two measurements were performed, the first at the beginning of pre-season (August) and second after eight months (March).

Results: Significant increase in the most of parameters was observed after eight months in all groups (p<0.05); as shown on the Table 1.

Measurement performed during the season showed that BF % was lower in group under 18 (F=29.031; p<0.0001) vs. group under 14 and group under 16. There was no significant difference of BF % between groups under 14 and under 16 (p>0.05). We also found significant difference in FFM between all three groups (F= 28.471; p<0.0001).

Conclusions: We observed significant changes in body composition parameters of young basketball players in eight months period. Comparison between age groups showed that younger basketball players in early adolescence have higher BF % than those in late adolescence, as a result of growth maturation and intensive training process.

Key words: Body composition. BIA. Young basketball players. Adolescence. Body fat.

Bioelectrical impedance analysis of the body composition of breath-hold divers

Sinobad Milica, Stefanovic Milica, Dikic Nenad

Vita Maxima Clinic, Sports Medicine Association of Serbia (SMAS)

Objective: The aim of this study was to determine if there is a significant difference in body composition between elite breath-hold divers and control group and if there is a significant correlation between body composition parameters of breath-hold divers and their rank on competition in Static Apnea (STA) and Dynamic with Fins (DYN) disciplines.

Patients/Methods: We studied a sample of 20 elite male breath-hold divers who were competing on 2nd Serbian Open Free diving Championship in two disciplines: all were competing in STA and 12 of them in DYN discipline in swimming pool. 20 male students of Belgrade University, who have never been involved in sport activities including any kind of diving, were control group. Sixteen variables of body composition were measured using Inner Scan Body Composition Monitor (TANITA, model: BC-545). Student's t-test for independent samples and nonparametric correlation test (Spearman's coefficient) were used in the data analysis.

Results: Weight and BMI were significantly lower in breath-hold divers comparing to control group (76±6,62kg vs. 85,41±9,21kg, p=0.002) and (23,46±1,59 vs. 26,45±3,44, p=0.001), respectively; while body water % was higher (61,38±0,27 vs. 55,08±2,96, p=0.001). Total body fat % and all variables of segmental body fat % were also lower in breath-hold divers group, p=0.001 vs. control group. We found no significant correlation (p>0, 05) between breath-hold divers' rank on competition and their body composition variables.

Discussion/Conclusion: According to our results, BMI, total body fat and segmental body fat are significantly lower in breath-hold divers comparing to the age-matched control group. Body composition could be successfully estimated with Bioelectrical impedance analysis in field and clinical setting. This analy-

Table 1. Stefanovic Milica, et al.

	Under 14 n=15			Under 16 n=17			Under 18 n=20		
	Pre-season	During season	p	Pre-season	During season	p	Pre-season	During season	p
Height (cm)	177.2±11	180.4±11	0.000*	186.8±10	188.5±9	0.000*	196.5±9	197.1±9.7	0.008*
Weight (kg)	61.2±14.2	66,2±14,3	0.000*	72.5±14	77.7±13	0.000*	86.9±14	90.3±13.0	0.001*
BMI (kg/m ²)	19.3±2.8	20,1±2,5	0.000*	20.6±2.7	21.7±2.6	0.000*	22.4±2.3	23.1±1.9	0.004*
BF (kg)	14.8±3.2	16,1±2,6	0.009*	14.2±3.9	16.3±3.2	0.016*	8.1±4.3	9.5±3.3	0.017*
BF (%)	9.3±3.9	10,9±2,6	0.000*	10.4±4.2	12.9±4.2	0.001*	7.5±5.2	8.7±4.1	0.020*
FFM (kg)	49.9±13.2	57,5±10,7	0.134*	62.1±11	64.8±10	0.004*	78.5±9.4	81.6±10.3	0.002*

*significant difference (p<0.05), body fat = BF, fat free mass = FFM

sis is important because percentage of body fat has a great influence on sport performance and its excess is often viewed as a major limiting factor in athletic performance.

Key words: Body composition. Body fat. Free diving.

Kineantropometric study for the selection of talents of speed athletics in Venezuela

Peña T¹, Siret R², Ceballos J³

¹Instituto Nacional de Deportes Venezuela; ²Instituto de Medicina de Deporte Matanzas Cuba; ³ISCF "Manuel Fajardo" La Habana Cuba

77 masculine Venezuelan athletes were studied among 11 and 14 years, competitors of 60 and 80 athletics meters during the municipal, school games and sport talents, made in Venezuela 2004.

They were carried out an evaluation complete kinanthropometric that included measuring weight, it carves (method of stretching of Tanner, 1964) diameters, heights, longitudes, circumferences, according methodology proposed by Martin and Seller (1957), Tittel and Wutscherk (1972), Candida and Esparza (1999), García and Pérez (2002), the proportion indexes were obtained (Siret, 2002) the somatotype (Heath and Carter, 1992), the indicators of composition (Jackson and Pollok, 1978), the decimal age, according to that proposed by Tanner (Jordan, 1979), morphologic age (Siret and et 1999), muscular areas, of fat of the arm, thigh, calf (Amador y Mermelo, 1993), the corporal surface (Issackson, 1958).

The significant differences settled down (student's t) among the groups 11-12, 13 - 14 years; the analysis applied to the variables that presented in form common correlation with the result in the two age groups it was determined the variables with double it influences in the speed, of which the percentiles of each group like reference were obtained for the establishment of normative of evaluation morphologic of the possible sport talents of speed of the Venezuelan athletics. The variables with double it influences in the speed were length leg and tall.

Key words: Kinanthropometric. Age groups.

Effect of short-term endurance and resistance training on total body and regional fat mass

Perez-Gomez J¹, Ara I^{2,3}, Martínez-Redondo D⁴, Vicente-Rodriguez G^{2,3}, Casajus J^{2,3}

¹Catholic University of San Antonio, Department of Physical Activity and Sport Sciences, Murcia, Spain; ²Growth, Exercise, Nutrition and Development (GENUD) research group. University of Zaragoza; ³Faculty of Health and Sport Science. Department of Physiotherapy and Nursing. University of Zaragoza. ⁴Departamento de Bioquímica y Biología Molecular y Celular. Universidad de Zaragoza. CIBER de Enfermedades Raras (CIBERER), ISCIII.

Introduction: Location of fat deposition is more closely related to cardiovascular health risk than total fat mass. Therefore, the aim of this study was to investigate the effect of short-term training on regional, and specifically, abdominal adipose tissue.

Materials and methods: Twenty-six healthy young men (22.5 ± 1.9 yr) were randomly assigned to three groups: control group (n= 11) and endurance (n = 7) or strength (n = 8) groups participating in 10 weeks of supervised experimental training.

Fat mass were measured by dual-energy X-ray absorptiometry (DXA) and an specific abdominal subregion analysis was made. The conventionally analysed trunk region includes chest and abdomen. A region of interest (ROI), from the lower costal margin to above the iliac crest was also analyzed with a variation coefficient lower than 4%.

Results: No differences were observed between groups in total or regional body fat before or after the training period. The control group did not change its total and regional body fat composition during the 10 weeks intervention. However, the endurance training group significantly decreased total body fat by 9% and percentage of fat by .1.2 units as well as fat (14% and 21%) and percentage of fat (1.7 units and 2.7 units) at the trunk and at the abdominal region respectively, with training (all p < 0.05). No significant changes were observed in fat mass with resistance training as well as in the control group.

For endurance training group, the change in abdominal percentage of fat was significantly higher compared with control group (-2.7 units vs. 0.5 units, p < 0.05).

Conclusion: Ten weeks of endurance training showed to decrease central and total body adiposity, especially in the fat accumulated in the abdominal region in young men.

Key words: Obesity. Strength training. Physical activity.

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-I

LANGUAGE: SPANISH

Prescription of physical exercise in primary health care and its implementation in municipal sports centers

Carranza Márquez MD, Naranjo Orellana J, Cayetano Méndez ML, Rueda Puente JD, de la Cruz Torres B, Molina Carranza JM, Mystal P, Nieto A, Flores M, Ortega M

Centro Andaluz de Medicina del Deporte, Distrito Sanitario Sevilla Norte, Centro de Salud La Algaba, Ayuntamiento de La Algaba

Introduction: Physical activity is related to a lower incidence of risk factors in the development of chronic diseases.

On the one hand, the medical staff specialised in Sports Medicine are an important tool in the prescription of physical exercise for chronic pathologies in primary health care. And on the other hand, the municipal sports centres are the perfect frame for this type of programmes. Taking into account the former considerations, a pilot project was created integrating the three following organizations: the "Centro Andaluz de Medicina del Deporte", the "Distrito Sanitario de Atención Primaria" and the city council.

Methodology: Sixty people were selected, 11 men with an average of 65 years of age and 49 women with an average of 56,6 years of age.

The criteria for being included in the programme were very specific.

The subjects were weighed and measured. They underwent a submaximun test of effort of step and an ECG. Finally, they were given a questionnaire about health perception and quality of life.

After the consultation they were indicated a personalized physical activity. The activity was practised three times a week during three months.

Results:

- The demand of primary health care was reduced a 55% in medical consultations and emergency medical services.
- Weight, height and Body Mass Index were reduced in men whereas in women it did not change.
- The evaluation of quality of life and health perception in the questionnaires improved in both cases.
- The submaximun test of effort of step; the work was fairly the same but at a lower frequency.
- Blood pressure drops in both cases.

Conclusion: As it has been proved, the results are surprisingly relevant for such a short period of time with physical activity. Consequently, physical exercise is recommended as a therapeutic instrument in chronic pathologies.

Assessment of cardiorespiratory function in Ischemic Stroke patients. Differences with older people without the pathology

Fleming F, Grossi M, Castro J, Vargas C

Kinesiology School, Medicine Faculty, Valparaíso University, Chile

The Chilean Health service, in the year 2006 creates a clinical guidance to the treatment of ischemic stroke patients in which one they do not mention the cardiorespiratory programs like a therapy option omitting other international references. The aim of this study is to compare the cardiorespiratory function between one group of chronic ischemic stroke patients (study group, n=5) and other group of elderly people without the pathology (reference group, n=5) in patients from Quilpué city of the Viña del Mar- Quillota Health service and obtain a preliminary information to include this patients into a cardiorespiratory program.

Both groups present similar characteristics of age, weight, height and comorbidity. After the application of the inclusion and exclusion criteria, the cardiorespiratory function was measured by 5 test: respiratory muscular strength, oxygen consumption, heart rate recovery, exercise tolerance and perceived exertion.

ORAL COMMUNICATIONS

For the respiratory Muscular Strength there was a 30,4% of difference found for the maximal inspiratory pressure ($p>0,05$) and 27,1% for the maximal expiratory pressure ($p>0,05$) between groups. The Peak Oxygen Consumption for the study group was 22,8% lower than the reference group ($p>0,05$), while the Heart Rate Recovery for this group was a 18% lower than the other group. In the 6 minutes walking test, the reference group presented significantly higher values in the 6 minutes walking distance and in the percentage walked from the expected distance than the study group ($p<0,05$ for each one). Finally, the study group presented higher values of perceived exertion than the reference group. The Study group presents lower cardiorespiratory performance than the reference group. This shows that it would be necessary a cardiopulmonary rehabilitation for the patients from the study group and maybe, modify the actual Chilean clinical guidance to ischemic stroke patients in the rehabilitation aspect.

Key words: Stroke. Cardiorespiratory function. Exercise test.

Analysis between physical activity, ingestion of liquids and antioxidant consumed in the juvenile population in CAM

Cabañas MD, Andrés A, Moreno Y, Perales A, Pachón S, Lemus A

Departamento de Anatomía y Embriología Humana II de la Facultad de Medicina de la Universidad Complutense de Madrid (UCM)

Introduction: The ingestion of liquids in the physical activity is a fundamental report to improve the yield and to prepare the lesionabilidad the ingestion of antioxidant this increasing so much to level of the population so much as sports. Our lens was to study the possible relations between level of physical activity, ingestion of liquids and antioxidant in the juvenile student population of the Autonomous Community of Madrid (CAM).

Material and methods: The sample consists of 107 individuals belonging to the CAM, 33 men and 74 women, whose middle ages belong to 20 ± 7 years. After signing the informed assent a survey of recollection was delivered of 24 hours and frequency of consumption of drinks, both validadas. Height was gathered, weight and perimeter of waist following (continuing) the protocol ISAK-GREC-FEMEDE. The physical activity was valued under the subjectivity of the own (proper) polled persons classifying her in light, it moderates or discharge. The results were tried by means of a leaf of Calculation Excel and the computer support DIAL for valuation of diets and calculations of nourishment.

Result: 55 % of the sample he (she) practises physical low activity, 39 % moderated, 5 % high. We emphasize that 67 % of the women it realizes physical low activity. The major caloric consumption is observed in the group of physical low activity for both sexes. The ingestion of water estimated like average global belongs to 1474,5 ml/day. Of the group of antirust (antioxidant), the requirements of vitamin And they are not covered in the totality of the sample, those of zinc are deficient in the men with physical moderate activity. The index of corporal global mass ($21,89 \pm 2,92$) indicates normopeso and the perimeter of waist inside normal parameters.

Conclusions: 1. A worrying sedentarismo is observed together with a major caloric ingestion, which in the future it can unleash in problems of obesity, osteoporosis and sarcopenia, though nowadays they do not present cardiovascular risk. 2. The indexes of health are inside the normality. 3. It is important to highlight the lack of vitamin And like antioxidant of importance opposite to the radical free ones. 4. The consumption of royal water is insufficient since the recommendations are not reached.

Key words: Antioxidant. Hydration. Physical activity.

Bronchial hyperreactivity prevalence in sport people in Malaga

Melero Romero C¹, Martín Fernández MC¹, Alvero Cruz JR² Sánchez Arjona C¹

¹Centro Andaluz de Medicina del Deporte de Málaga. Consejería de Turismo, Comercio y Deporte, Junta de Andalucía; ²Escuela de Medicina del Deporte. Universidad de Málaga.

Introduction: It's not clear the prevalence of bronchial hyperreactivity in sportsmen. If we reviewed the bibliography the values are included between a large rank (11-50%). The reason is that, the different bronchial hyperreactivity definition, the type of diagnose method used, the technique, the population, the

age and gender, the countries of the study, the study season has been carried out and the sport discipline. In several studies it has been suggested if bronchial hyperreactivity prevalence is greater in elite sportsmen, according to the Olympic Committee of the United States in 1984's Olympic Games, the 11% of the athletes displayed bronchoconstriction induced by the exercise, whereas in the general population it was between 4 and 7%. This can be due to the physical effort intensity during the sport activity. This prevalence has been increased during the two last decades, specially between the elite sportsmen who compete in the resistance modality. We have analyzed the bronchial hyperreactivity prevalence in a professional athletes group of different sport activities who represent the population of Malaga.

Methods: 80 voluntary athletes participated in this study (endurance sports 72, aerobic-anaerobic 6 and anaerobics sports 2). We carry out Metacholine test to bronchial hyperreactivity role ($FEV1 \geq 20\%$ drop of reference values).

Results: We showed positive reaction in 69% of endurance sports (marathon, cycling, canoeing, rowing, triathlon), 9% in aerobics-anaerobics sports (basketball, handball, rugby, soccer) and 1.3% in anaerobics sports (weightlifting).

Conclusion: This study shows high prevalence of this pathology in endurance sports. It is necessary to carried out other diagnosis methods to confirm the greater prevalence in these sports.

Key words: Bronchial hyperreactivity. Diagnosis. Sport.

Pilates protocols for knee injuries in sports

Calvo JB¹, Cabral L²

¹Department of Anatomy-University of Alcala; ²Corpora Pilates Madrid

Introduction: The Pilates Method is a movement therapy that have excellent results because its functional training. It could be done on the floor but for Rehab is better to do treatment on the machines that have with different springs and possibilities. For example, the muscles can move isometrically, concentrically and/or eccentrically, and for sports you can re-training the specific sports patterns.

Material and methods: 85 patients received treatment and rehab including Pilates exercises and where compared with 150 patients treated with conventional protocols during the past 5 years.

The Pilates group had: meniscal tears (12), anterior cruciate ligament (14), patellar syndromes (35) and others (24).

The protocols includes: active and passive mobilization, strength, and proprioceptive training.

The focus were at: alignment, core control, functional organization and isolation of the leg movement and pelvic movement, and breathing.

The exercises were:

At Trapeze/Cadillac: Long Spring Legs, Tower Leg Press, Prone Press, 90/90, assisted Squats, and Breathing.

At the Reformer: At the Reformer: Footwork Leg Press, Leg Circles Arcs, Knee Ext Seat, Lunge, Stomach Massage and Standing Series.

At the Chair: Stand and Seat Leg Press, Soleus Decelera and Lunge to Stand And at Mat: Femur Arcs, Side Kick, Bridging, and Single Leg Stretch.

We added implements at different phases of the treatment in order to improve the challenge or to facilitate the movement.

Results and Conclusions: Time to return to activities were faster in all patients of the Pilates group.

For different sports and pathologies, the order of the exercises are different.

In this paper we show the exercises in 3 phases: basics, intermediate and advance. Pilates is very effective as kinesiotherapy, and specially for sports rehab.

Key words: Pilates. Knee Rehab.



Figure 1. Calvo JB, et al.

The effects of 20 weeks of aerobic exercise on women with fibromyalgia

Sañudo B¹, Galiano D², Carrasco L¹, Saxton J³, Romero S¹, De Hoyo M¹

¹Departamento de Educación física y deporte. Universidad de Sevilla; ²Departamento de Deporte. Universidad Pablo de Olavide (Sevilla); ³Centre of Sport and Exercise Science. Sheffield Hallam University

Objetivo: To measure the physical function of individuals with fibromyalgia (FM) after 20 weeks of supervised aerobic exercise

Methods: 42 women with FM were randomized to either an aerobic program (n=22; 59,14 ± 7,66 yrs) or control group (n=20; 61,10 ± 9,60 yrs) and were examined with the six-minute walk test, the Fibromyalgia Impact Questionnaire (FIQ) and Short-form Health Survey (SF-36) before and after 20 weeks.

Results: As compared with baseline, symptom severity, physical function (6MWT) and quality of life (FIQ and SF-36) showed improvements after the completion of treatment. No significant differences were found on the control group.

Conclusions: Our results confirm that aerobic exercise is beneficial to patients with FM and it can improve physical function and symptom severity after 20 months of treatment.

Key words: Fibromyalgia. Aerobic exercise. Quality of life. Physical therapy.

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-I

LANGUAGE: ENGLISH

Can we use strength training for diagnosis of calcified tendonitis in the shoulder?

Tsur A¹, Loberant N², Volpin G³

¹Rehabilitation Unit; ²Institute of Radiology; ³Department of orthopedics. Western Galilee Hospital, Nahariya, Israel

Preface: Calcified tendonitis of the shoulder is an acute or chronically painful condition that is caused by inflammation around calcium deposits located in or beside the rotator cuff tendons. When it becomes painful, it usually has an abrupt onset and can severely limit activity, even though it is not necessarily activity-dependent. The diagnosis is made by history and physical examination with specific attention to radiographic evidence of calcification.

Case report: Fifty-seven years old man, left handed dominant, with a history of several decades in body building, began to suffer from pain inside his right shoulder appears gradually during strength training, doing overhead external rotation movements of his arm. The most painful movements were:

- Back presses: hold the bar across the back of the neck with an overhand grip and extend it straight up.
- Back lat pull-downs: grasping the bar with a wide overhand grip and pull it down to the back of the neck.
- Dumbbell flies: lie on a bench and hold a dumbbell in each hand with arms extended and open them to horizontal.

In the physical examination, it was impossible to find a point of tenderness, local swelling or friction in the involved shoulder. Calcium deposits could be seen on plain radiographs and ultra-sound of the shoulder. These views help to localize the deposit to the supraspinatus tendon. Ultrasound evaluation of the shoulder has been proved to be an accurate and noninvasive screening tool for the diagnosis of calcified tendonitis.

Conclusions: Tension overload is a mechanism that can result in damage to the supraspinatus tendon. Generally, this lesion occurs in the fourth or the fifth decades and it is slightly more common in the non-dominant arm.

Key words: Calcified tendonitis. Shoulder. External rotation. Strength training.

Chronic-exercise effects on glucose homeostasis and adipokines in the adult OZ-rat model of metabolic syndrome

Condezo L¹, Carrascosa JM¹, Balfagón G², Ortega E³, De la Fuente M⁴, Manso R¹

¹Departamento de Biología Molecular and Centro de Biología Molecular "Severo Ochoa" (CSIC-UAM); ²Departamento de Fisiología, Facultad de Medicina, Universidad Autónoma de Madrid;

³Departamento de Fisiología, Facultad de Ciencias Biológicas, Universidad de Extremadura; ⁴Departamento de Fisiología, Facultad de Biología, Universidad Complutense de Madrid, Spain

Obesity has evolved worldwide as a major threat to health and is a frequent landmark of the metabolic syndrome (MetS), a condition characterized by the occurrence of a cluster of disorders that are risk factors for type 2 diabetes mellitus and atherosclerosis. Changes in lifestyle, including exercise habits are considered sufficient to overcome obesity and ameliorate the risk factors associated with the MetS. However, efforts made to reverse this trend in humans have generally been less successful than expected. Most experimental data reporting positive effects of programmed exercise on animal models of obesity and MetS were obtained with young animals (3-4 months) and there is a lack of information on whether older animals would also respond positively. We have designed an exercise programme of treadmill-running (EPTR) based on adaptation, progression and maintenance phases of 1-month duration each, to test the effects of programmed exercise on risk factor markers of type 2 diabetes mellitus and cardiovascular disease in adult Obese Zucker (OZ)-rats. Adherence to the EPTR did not reduce body weight gain (BWG) significantly during adaptation but reduced it during the progression and maintenance phases. The increment of glycemia with age observed in sedentary animals was cushioned during the progressive phase of the EPTR. However, glycemia increased (8.2 to 16.2 mM) in sedentary and even more (7.4 to 20.2 mM) in chronically exercised OZ-rats during the maintenance phase. At the end of the EPTR in 6-month old animals plasma insulin was higher and the protective adipokine adiponectin was lower in chronically exercised animals than in sedentary. An inverse correlation was observed between blood glucose levels and BWG (-0.530, p=0.002) and adiponectin (-0.504, p=0.004) and a positive one between adiponectin and BWG (0.361, p=0.043). The accumulated evidence suggests that responsiveness to exercise in obese individuals greatly decreases with advancing age.

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. Adipokines. Chronic exercise.

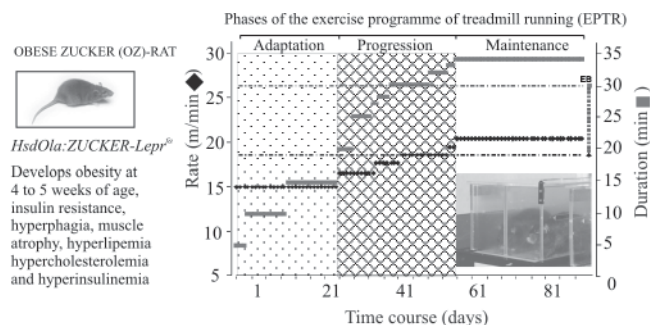


Figure 1. Condezo L, et al.

Systemic inflammatory status in chronic kidney disease: effect of one month of moderate aerobic exercise

Viana J¹, Smith A², Kosmadakis G², Clapp E¹, Feehally J², Bishop N¹

¹School of Sport and Exercise Sciences, Loughborough University, UK; ²John Walls Renal Unit, Leicester General Hospital, UK

Introduction: It is well established that patients with chronic kidney disease (CKD) suffer from chronic systemic inflammation. Plasma levels of inflammatory markers such as C-reactive protein (CRP) and interleukin-6 (IL-6) are elevated in CKD and have been shown to predict mortality. Regular exercise may exert anti-inflammatory effects, and following a programme of moderate exercise has been shown to reduce plasma CRP and IL-6 levels in various chronic diseases. To date, the influence of exercise on inflammatory status in patients with CKD is unclear. Therefore, the aim of this study was to investigate

Table 1. Viana J. et al. Plasma CRP and IL6 concentrations and circulating total and differential leukocyte counts in response to the exercise programme (mean \pm SEM)

	Baseline	1 month	P
CRP ($\mu\text{g}\cdot\text{mL}^{-1}$)	6.3 \pm 2.4	5.1 \pm 1.6	0.440
IL-6 (pg $\cdot\text{mL}^{-1}$)	4.1 \pm 0.9	2.9 \pm 0.5	0.041
Leukocytes (x 10 ⁹ $\cdot\text{L}^{-1}$)	5.9 \pm 0.6	6.0 \pm 0.6	0.872
Neutrophils (x 10 ⁹ $\cdot\text{L}^{-1}$)	3.9 \pm 0.4	3.8 \pm 0.4	0.848
Lymphocytes (x 10 ⁹ $\cdot\text{L}^{-1}$)	1.3 \pm 0.2	1.4 \pm 0.2	0.288
Monocytes(x 10 ⁹ $\cdot\text{L}^{-1}$)	0.5 \pm 0.0	0.6 \pm 0.1	0.499

the effects of 1 month of regular moderate aerobic exercise on plasma CRP and IL-6 in CKD patients.

Methods: Fifteen CKD (stage 4) patients (11M and 4F) with a mean age of 60 years (range 50-73 years), exercised for 30 min at least 5 times per week for a total period of 1 month. The exercise programme consisted of brisk walking at a speed that was adjusted to correlate to a Borg Rate of Perceived Exertion (RPE) of 12-14, and a heart rate range that was elicited by the target RPE. Patients kept exercise diaries and were monitored to ensure compliance. Before (baseline) and after 1 month of regular exercise patients performed a standard 30 min treadmill exercise test. Resting venous blood samples were collected on both occasions for the measurement of plasma CRP and IL-6 concentrations and total and differential leukocyte counts. Results were analysed using Student's paired t-tests.

Results: Average RPE response to the exercise test at 1 month (mean \pm SEM: 11 \pm 0) was lower than at baseline (13 \pm 0, P=0.001). After 1 month of exercise, plasma IL-6 levels were reduced, while plasma CRP levels had not significantly changed (Table 1). Total and differential leukocyte counts also remained unchanged (Table 1).

Conclusions: These results indicate that regular moderate aerobic exercise might exert anti-inflammatory effects in CKD patients. While 1 month of exercise was sufficient to bring about a significant reduction in plasma IL-6 levels it had little effect on plasma CRP levels. Longer duration and controlled trials may elucidate these potential effects.

Acknowledgments: João Viana is supported by a Portuguese Foundation for Science and Technology (FCT-MCTES, Portugal) scholarship (SFRH/BD/27838/2006).

Key words: Chronic kidney disease. Exercise. Inflammation. C-reactive protein. Interleukin-6.

Specific training can improve sensorimotor control in type 2 diabetic patients

Thorwesten L¹, Eichler A¹, Sperlbaum C¹, Eils E², Rosenbaum D², Völker K¹

¹Institute of Sports Medicine, University Hospital Münster, Germany; ²Movement Analysis Lab, Orthopaedic Department, University Hospital Münster, Germany

Introduction: Diabetes mellitus often is associated with proprioceptive and sensory deficits as a result of distal diabetic polyneuropathy (DPN). The aim of this prospective controlled longitudinal trial was to evaluate a specific sport intervention program regarding sensorimotor capabilities in type 2 diabetic patients compared to healthy controls.

Methods: 15 type 2 diabetic patients (7 female, 8 male; age 64 \pm 10 years) whose disease is known since \bar{O} 9.5 years, and 14 healthy volunteers (7 woman, 7 man; age \bar{O} 56 \pm 7 years) participated in this study. Using Semmes-Weinstein-Monofilaments (SMW) 5.07 log₁₀(g) the diabetic patients were divided into diabetic PN as well as diabetic non PN group (non-DPN group n=9, DPN group n=6). 5 different measuring systems were used in test and retest: Sensibility threshold testing using SWM, postural balance testing with force plate, active angle-reproduction test of the ankle, plantar foot pressure measuring (Emed ST) dynamic stability testing (Biodex-Stability-System). A 90-minute special training program has to be completed once a week over a 8 month period.

Results: Comparing test-retest results of the sensibility threshold testing with SMW all plantar measuring points showed a slight increasing sensibility in the DPN group. Significant changes in threshold testing could be demonstrated in

lateral forefoot and hallux area. Joint position sense measured with the angle reproduction test showed significant reduction of reproduction error in the diabetic group. For all other measuring methods no significant changes could be found.

Discussion & Conclusion: A specific training can lead to positive changes in sensorimotor capabilities in type 2 diabetic patients. These results demonstrate the possibility of modulating proprioceptive deficits in diabetic patients during therapeutic intervention. Basic cause of this modulation could be found in an increasing cerebral processing using the given reafferent sensory input.

Key words: Type 2 diabetic. Polyneuropathy. Proprioception.

Assessment of handgrip strength, quality of life and physical activity in Chilean patients on peritoneal dialysis

Cano M^{1,2}, Pacheco A³, Torres R³, Kamisato C¹, Mauro J¹, Sanhueza ME³, White A⁴

¹Laboratory of Exercise Physiology, Faculty of Medicine, University of Chile; ²Group EFFECTS 262, Department of Medical Physiology, Faculty of Medicine, University of Granada; ³Nephrology Section, Department of Medicine, University of Chile, Clinical Hospital; ⁴Physiology and Biophysics Program, Institute of Biomedical Sciences, Faculty of Medicine, University of Chile

Introduction: Chronic kidney disease patients suffer deterioration on physical capacity and a decrease on indicators of quality of life (QOL). This can be demonstrated in questionnaires designed for this purpose like KDQOL-SF36.

The International Physical Activity Questionnaire (IPAQ), has been validated to estimate physical activity (PA) in several groups of patients with chronic diseases, and also handgrip strength (HGS) has been related to the QOL of the chronic and elderly patients. Nevertheless, these instruments have been scantily explored in patients in Peritoneal Dialysis (PD).

Methods: This study was conducted to determine the level of PA, QOL and HGS in a group of Chilean patients in treatment with peritoneal dialysis (PD), and compare with a healthy group (H).

Under informed consent, 14 chronic ambulatory PD and 14 healthy subjects with similar characteristics of age, height, weight, occupation and comorbidity were studied.

We used the questionnaires KDQOL-SF36, the International Physical activity Questionnaire (IPAQ in its long form) and a test to evaluate hand grip strength (Dynamron dynamometer).

The results were expressed in median for the QOL and PA and mean \pm SD for HGS. The statistical analysis was made with the statistical software SPSS 15.0.

Results: There was statistical difference on relative force of handgrip (hand grip strength measured with a dynamometer divided by body mass) between the group of healthy subjects and patients on peritoneal dialysis (p=0.007).

The QOL in patients on PD was significantly minor than the healthy subjects and only there were no differences in Mental Health (p=0.07) and Social Function (p=0.06).

We found no differences on PA estimated with the IPAQ between H and PD groups (p=0.874).

Conclusion: We conclude that this PD group presents deterioration on QOL, compared with healthy subjects, as well as on HGS. As we found no differences on IPAQ, there would be some concern about the usefulness of this instrument on PD patients.

Key words: Handgrip strength. QOL. Physical activity.

MANAGEMENT AND TREATMENT OF ILLNESS THROUGH PHYSICAL EXERCISE-II LANGUAGE: ENGLISH

Effects of aquatic training in patients with haemophilia A

Gallach JE¹, Perez S^{2,3}, Garcia X¹, Gomis M⁴

¹Department of Physical Education and Sport. University of Valencia. Spain; ²Department of Physiotherapy. University of Valencia. Spain; ³Coagulopathy Unit, Hospital LA FE, Valencia. University of Valencia. Spain; ⁴Area of Physical Education and Sports, Miguel Hernandez University of Elche, Spain

Introduction: Literature repeatedly uses lactic acid as an indicator of the level of effort when a subject exceeds the anaerobic threshold while doing exercise.

- Likewise, an individual's aerobic power is one of the parameters which best relates physical activity with his/her health.

- Since haemophiliacs' physical conditions noticeably worsen owing to the musculoskeletal problems they face throughout their lives, our OBJECTIVE was to obtain results from a water-based physical activity programme with such patients.

Material and method: A total of ten haemophiliacs participated in this study, aged between 23 and 41 years, who received different types of treatment. They took part in a 9-week aquatic training programme with three 60-minute sessions a week.

- The Cooper Test was chosen to assess their capacity before and after participation.

Results: No significant differences were noted in the levels of lactate found after completing the pretest and post-test, whereas the distances achieved in both tests differed significantly.

Conclusions: The results obtained allow us to confirm that the training programme improved the subjects' resistance (i.e., longer distance achieved). Nonetheless, the fact that no significant change was noted in the post-exercise lactic levels emphasises the view that the improvement observed was the result of training and not of other confounding variables such as the level of effort exerted in both tests (Table 1).

Key words: Lactate. Aerobic power. Haemophilia

Table 1. Gallach JE, et al. The subjects' performance during the Cooper Test before and after aquatic training

	Lactic level at 5 min	Metres achieved
Pre-test	8.32 (3.68)	1296.48 (189.78)
Post-test	9.15 (2.96)	1486.89* (161.57)

The data are the means (SD) of the metres achieved. * Indicates a significant difference with regard to the pre-test ($p < 0.01$)

Relationship between weight lifted and energy expenditure during resistance circuit training

Benito PJ, Alvarez M, Morencos E, Cupeiro R, Peinado AB, Diaz V, Calderon FJ

Facultad de Ciencias de la Actividad Física y del Deporte – INEF, Universidad Politécnica de Madrid

Aim: To determine the variables related with total energy expenditure (EE) at different intensities during a specific resistance circuit training (RCT).

Material and methods: Twenty-four subjects participated in this study, twelve men aged 20-26 years and twelve women aged 18-29 years.

A specific RCT was carried out including eight exercises putting in upper and lower limbs. The RCT was performed at six different intensities from 30% to 80% of 15RM in random order and with a rhythm (1:2, concentric-eccentric) fixed for the execution of the exercises.

The total EE was measured as the sum of aerobic EE (oxygen uptake (VO_2)), anaerobic EE (lactate concentration) and EPOC¹ (excess post-exercise oxygen consumption).

Step by step regression analyses was used to predict EE during the different intensities. The Pearson's product-moment correlation coefficient was used to analyze relationships among variables. Significance level was fixed at $p < 0.05$.

Results: A strong relationship was observed between the total EE and the load (weight) lifted ($r = 0.810$ and $r = 0.647$; $p < 0.001$ for men and women respectively). On the other hand, the load lifted and intensity of the RCT were strongly related ($r = 0.840$ and $r = 0.913$ with $p < 0.001$ for men and women respectively).

The mean EE was 6.6 ± 2.3 kcal \cdot min⁻¹ for men and 3.3 ± 0.6 Kcal \cdot min⁻¹ for women. The EE during the circuit could be estimate with a standard error of estimation of 37.5 kcal ($R^2 = 0.803$), using the following equation:

EE (Kcal) = $108.5 + 14.617 * Vol_t(t) - 39.58 * Sex$ (1=men, 0=women); where Vol_t is the weight lifted in tons during the whole RCT.

The EE for one ton of weight lifted was 20.8 ± 4.2 kcal \cdot t⁻¹ for men (average among 30 to 80% 15RM) and there was no significant correlation between intensity and EE ($r = -0.110$; $p > 0.05$). However, in women a range from 30.2 ± 5.0 Kcal \cdot t⁻¹ to 15.8 ± 2.3 Kcal \cdot t⁻¹ was found among 30-80% 15 RM and a significant correlation was observed between intensity and EE ($r = -0.772$ $p < 0.01$).

Discussion and conclusion: A strong relation between the load lifted and the EE is shown. In our work, the stronger relationship could be due to the execution rhythm fixed, as it was controlled and remained constant. Indeed, Munn, et al.² have shown the effect of rhythm on EE during resistance training.

Beckham, et al.³ presented the following data of EE: 6.21 ± 1.01 kcal \cdot min⁻¹ for men and 4.04 ± 1.4 kcal \cdot min⁻¹ for women, but these authors neither differ among intensities nor take in account the anaerobic component. However, other works show that the intensity can influence in the lactate concentration and EPOC when comparing slight vs intense loads⁴.

In conclusion, in the exercise prescription it should be taken in account the intensity of the CRT in order to estimate the EE.

References:

1. Scott CB. *J Strength Cond Res* 2006;20:404-11.
2. Munn, et al. *Med Sci Sports Exerc* 2005;37:1622-6.
3. Beckham, et al. *J Sports Med Phys Fitness* 2000;40:118-25.
4. Thornton, et al. *Med Sci Sports Exerc* 2002;34:715-22.

Key words: Weight lifted. Energy expenditure. Resistance.

Effect of short-term endurance and resistance training on lipid profile

Perez-Gomez J¹, Ara I^{2,3}, Martínez-Redondo D⁴, Vicente-Rodriguez G^{2,3}, Casajus J^{2,3}

¹Catholic University of San Antonio, Department of Physical Activity and Sport Sciences, Murcia, Spain; ²Growth, Exercise, Nutrition and Development (GENUD) research group. University of Zaragoza; ³Faculty of Health and Sport Science. Department of Physiotherapy and Nursing. University of Zaragoza; ⁴Departamento de Bioquímica y Biología Molecular y Celular. Universidad de Zaragoza. CIBER de Enfermedades Raras (CIBERER), ISCIII

Introduction: We aimed to study the effect of short-term training on the lipid profile and to examine the associations between changes in lipid profile and in body composition after training.

Materials and methods: Twenty-six healthy young men (22.5 ± 1.9 yr) were randomly assigned to three groups: control group ($n = 11$) and endurance ($n = 7$) or strength ($n = 8$) groups participating in 10 weeks of supervised experimental training. Cholesterol, high and low density lipoproteins (HDL and LDL) analysed in blood serum as well as body composition analysed by DXA were determined at baseline and after the training period.

Results: For the resistance training group, total cholesterol (159.9 ± 17.9 vs. 149.4 ± 18.6), HDL (58.4 ± 8.7 vs. 51.3 ± 10.8) and LDL (90.8 ± 15.6 vs. 86.3 ± 15.7) decreased significantly. For endurance training group, the percentage change in HDL was significantly greater compared with control group (-13.8 ± 8.8 vs. -0.4 ± 12.0 ; $p < 0.05$). In the control group changes in HDL and LDL showed a close correlation with changes in trunk fat, and changes in LDL with changes in abdominal fat. In the endurance training group, changes in total cholesterol strongly correlated with changes in total body weight. Changes in HDL with changes in total body lean mass and weight. In the resistance training group, changes in total cholesterol strongly correlated with changes in weight and in trunk and abdominal fat; and changes in HDL with changes in weight and in total body and trunk fat mass (all $p < 0.05$).

Conclusion: Ten weeks of resistance training decreased total cholesterol, HDL and LDL. The changes were associated with changes in weight, and trunk and abdominal fat. Additional investigation is required in order to better understand the associations between specific training programs and lipid profile.

Key words: Dyslipidemia. Strength training. Physical activity.

Three years longitudinal study about body composition and functional capacities in eleven Down syndrome children

González de Agüero A¹, Vicente-Rodriguez G^{1,2}, Casajus JA^{1,2}

¹GENUD (Growth, Exercise, Nutrition and Development) research group; ²Faculty of Health and Sport Sciences. Department of Physiotherapy and Nursing. University of Zaragoza.

Introduction: Children with Down syndrome (DS) often present obesity related diseases¹. Exercise improves cardiovascular capacities. Therefore it was aimed

Table 1. Gonzalez de Agüero, et al

	Baseline (B)	Post-training1 (PT1)	Change% B to PT1	Post-training2 (PT2)	Change% PT1 to PT2	Change% B to PT2
	Mean (SD)	Mean (SD)		Mean (SD)		
VO _{2peak} (mL/min/kg)	34.26 (8.24)	42.74 (12.2)	29.42	33.07 (6.42)	-25.41	-3.47
VO _{2peak} (L/min) *	1.14 (0.45)	1.45 (0.56)	33.92**	1.33 (0.35)	-13.15	16.31*
HRpeak (beats/min)	161 (13.6) -1.52	166 (12.2)	2.63	159	(15.2)	-4.04
%BF	18 (5.86)	18 (6.37)	1.46	21 (7.46)	19.31**	22.72**

* $p < 0.05$; ** $p < 0.01$

to study the changes in cardiovascular capacities and body fat and the possible relationship between them in DS children during growth.

Material and methods: We studied 11 DS children (5 girls) aged between 7-17 yr in 3 different moments over 3 years. Percentage of body fat (%BF) by Siri equation was assessed. Total and relative peak of oxygen uptake ($V\dot{O}_{2peak}$) and peak of heart rate (HR_{peak}) during a treadmill exercise test³ with a gas analyzer with electrocardiograph were also performed. The data were taken at baseline, six months later after a supervised exercise programme (PT1) and 30 months later after non-supervised exercise participation (PT2). Student's t-tests were applied to test the changes; Pearson's correlations to study the relationships between changes in functional capacities and changes in %BF.

Results: Table 1 summarized the differences between baseline, PT1 and PT2. With supervised programme total and relative $V\dot{O}_{2peak}$ and HR_{peak} increased. However, with non-supervised exercise total and relative $V\dot{O}_{2peak}$ and HR_{peak} decreased. Percentage of BF showed a correlation of -0,7 with $V\dot{O}_{2peak}$ (PT2) ($p < 0,05$).

Conclusions: Supervised exercise program had considerable effect on health related body composition and cardiovascular variables. Since DS children respond to specified exercise, this could be standardized and applied to enhance health in those children.

References:

1. Chumlea WC, Cronk CE. Overweight among children with trisomy. *J Ment Defic Res* 1981;25(Pt 4):275-80.
2. Casajús JA. Salud, ejercicio físico y Síndrome de Down. Zaragoza: Edelvives, 2007.

Key words: Down syndrome. Oxygen uptake. Fat percentage.

Exercise impact in integral treatment in cancer patient. The patient case: metastatic mixed germinal tumor

García Alarcón GA

Facultad de Medicina, Universidad Autónoma del Estado de México

Introduction: Now there are more cancer survivors every day and is a medical obligation offering them high life quality.

Objective: To evaluate physical exercise roll in the integral treatment in the cancer patient.

Material and method: Case research. Male 19 years old, soccer player, mesoendoctomorphic, with VO_{2max} de 51 ml/kg/min. who was diagnosed, last November 2007, with metastatic mixed germinal tumor, with poor bad prediction. He received 6 BEP cycles + 2 docetaxel/gemcitabine cycles. After 2nd chemotherapy line he suffered important bleomycin toxicity at pulmonary level with acute respiratory insufficiency associate pulmonary fibrosis and infection in low respiratory via. During oncologic process we prescribed physical activity to healthy goal.

Results: Physical exercise helped, in natural way, to admit the oncology patient condition, as well, to reduced duration time and physical and psychological symptoms intensity slide to chemotherapy. Nevertheless, treatment toxicity to some target organs, physiological and biochemistry modifications/ adaptations to exercise hold physiological stress up with beneficent. Besides, the organic impact by complication's chemotherapy toxicity was reduced through exercise. June 2008: SatO₂ 68%. Spirometry: FEV1 44.2%; FVC 47.1%; EVC38.7%; ERV 29.3%. After respiratory rehabilitation exercise, September 2008: SatO₂:

96%. Spirometry: FEV1: 79.4%; FVC: 73.3%; EVC: 65.2%; ERV: 73.2%.

Conclusions: The patient's initial fitness let him to face successful oncology illness. Exercise program improve treatment tolerance and decrease slide chemotherapy effects. Physical activity, systematic, programmed and supervised helped to the patient to improve his life quality.

Suggestions: Physical exercise must be essential component in integral treatment in patients with cancer. It's necessary to include Sport Physician in oncologic multidisciplinary team, and show beneficial exercise effects forth and the importance to maintain fitness in patients with cancer.

Key words: Exercise and cancer. Cancer integral treatment. Treatment metastatic germinal tumor.

NUTRITION AND SPORTS SUPPLEMENTATION-I LANGUAGE: SPANISH

A dietary supplement based on *Lippia* enhances endogenous antioxidant defenses

Funes L¹, Carrera L², Fernández S¹, Cerdá M¹, Pons A³, Roche E², Micol V¹

¹Instituto de Biología Molecular y Celular. Universidad Miguel Hernández. Elche-Alicante. Spain; ²Instituto de Bioingeniería. Universidad Miguel Hernández. Elche-Alicante. Spain; ³Laboratori de Ciències de la Activitat Física Dept. Biologia Fonamental i Ciències de la Salut. Universitat de les Illes Balears. Spain

Introduction: Intervention studies using dietary antioxidants supplementation (mainly vitamins) evidence that these may play an important role in the defense against oxidative stress induced by exercise and decrease negative effects on blood cells and muscular damage. The aim of this study was to determine the influence of a dietary supplement composed of *Lippia* sp. on blood and biochemical parameters, antioxidant enzymes and cytokine levels.

Materials and methods: *Subjects:* Fourteen young subjects participated in a double-blind and placebo-controlled study. One group had the dietary supplement in capsules (1g/day) for 21 days while the other group took a placebo. Both groups were performing similar exercise protocol (90 min running 3 days/week). Blood samples were taken before and after 21 days of supplementation period. Washout period was 20 days.

Lymphocytes, neutrophils and erythrocytes purification: blood cells were fractionated from blood samples following an adaptation of Boyum (1964). Hematological and biochemical parameters were measured in automatic auto analyzer.

Enzymatic determinations: catalase, glutathione reductase and superoxide dismutase activities were determinate as described in A. Sureda, et al 2006 with some modifications.

Cytokine assays: Cytokines were measured in blood diluted in RPMI 1640 (1/10) stimulated with E. coli lipopolysaccharide using specific immunoassays according to the manufacturer's instructions.

Results and discussion: Several values were determined related to hepatic or muscular dysfunction in both placebo and supplemented groups. Among them, only GOT enzyme showed a significant decrease in the supplemented group, while no significant changes was observed in the placebo group (Table 1). A decrease in creatin kinase activity was also observed in both groups but was no significant.

Table 1. Funes L, et al. Influence of Lippia supplementation on several enzymatic activities (*indicate P<0.05)

		Pre-treatment	Post-treatment
GOT (U/L)	Placebo	31.86 ± 4.36	28.28 ± 2.36
	Supplemented	27.30 ± 2.57	20.71 ± 2.61*
Creatin Kinase (U/L)	Placebo	332.3 ± 72	256.33 ± 39
	Supplemented	287.67 ± 52.3	224.14 ± 31

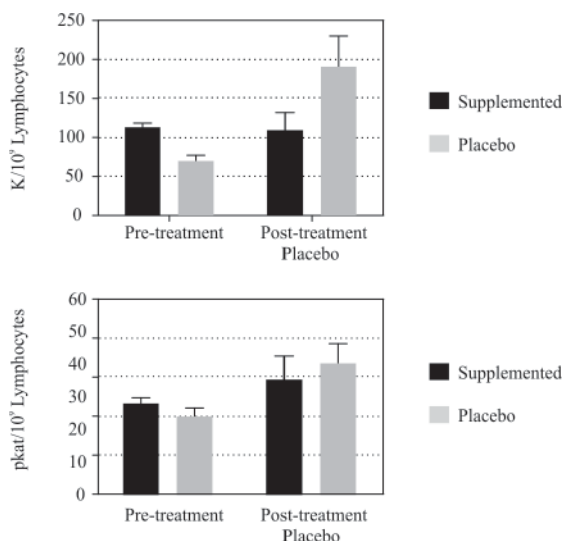
**Figure 1.** Funes, et al. Effect of Lippia supplementation on the response of lymphocytes antioxidant enzymes: (A) catalase and (B) SOD. (*) Indicate significant differences between supplemented vs. placebo groups. Means ± SEM, n=7. Statistical analysis was performed by One-way ANOVA test

Figure 1 shows the activity of lymphocyte antioxidant enzymes in both groups before and after the supplementation. Catalase and superoxide dismutase (SOD) activities increased in the supplemented group after 21 days, revealing an almost 3-fold increase for catalase and 2-fold for SOD. A decrease of the proinflammatory interleukine IL-6 was observed for both groups but was only significant for the supplemented group. The results suggest that *Lippia* sp. supplementation may have beneficial effects against oxidative stress and inflammatory response derived from intense exercise by decreasing muscular damage, and stimulating endogenous antioxidant defenses and decreasing pro-inflammatory cytokines.

Key words: Exercise. Stress. Antioxidant.

Effects of caffeine ingestion on attentional performance at rest and moderate aerobic exercise

Huertas F¹, Blasco E¹, Zahonero J¹, Moratal C¹, Lupiáñez J²

¹Catholic University of Valencia; ²University of Granada

Introduction: The ergogenic effect of caffeine on sports performance is well documented. The relatively recent removal of this substance from the World Anti-Doping Agency list of prohibited substances has increased dramatically its consumption by sport practitioners. Many papers have informed about the isolated effect of ingestion of caffeine on one type of variable (motor, perceptual, cognitive, physiological...) or at one level of activity (rest, moderate or high aerobic or anaerobic exercise...).

Objective: Our study investigates whether caffeine ingestion (4 mg/kg) has a differential effect on attentional and motor performance depending on the level of activity (rest vs. moderate aerobic cycling exercise).

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) in four experimental conditions: exercise/caffeine, exercise/placebo, rest/caffeine/ and rest/ placebo. Order of these four conditions was counterbalanced across participants. A repeated

measured ANOVA were used to estimate main effects and interactions for median values of reaction time (RT).

Results: Preliminary 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. Moreover, moderate aerobic exercise reduced attentional cost and facilitates conflict's solving, thus improving performance of the orienting and executive control networks. Finally, our data suggest that caffeine ingestion only modulates RT at rest condition (leading to faster RT) but in the exercise condition. This interaction could be related to the ergogenic effect of caffeine (reduction of exercise effect).

Conclusion: Our results may contribute to improve the knowledge about the effects of caffeine ingestion on ergogenic and cognitive performance. It will optimize the more effective ingestion prescription according to physiological or psychological demanding of sport environmental characteristics.

Key words: Caffeine. Attention. Exercise.

Study on the physiological effects of the continued seawater intake in sportsmen

Ballester MA

Chair of Physiology of the Exercise, San Antonio Catholic University from Murcia

Introduction: Our aim is to study the modifications in analytical parameters obtained during a test of effort and the recovery period, after the previous and continued intake of cold microfiltered and sterilised seawater in a group opposite a placebo group.

Material and methods: Crossed blind double clinical test.

Population: Indoor soccer players of a national team with ages between 21 and 25 years.

Methodology: Due to the characteristics of the sport selected, we use the system called "Latin square" in which each player controls itself, we gave the seawater during 6 weeks to a group opposite a placebo group; we set up a "cleaning" month period and changed later the product used administering it for a period of identical time.

Material:

Pulsimeter Polar Advantage S810 with specific software

Electrocardiograph mark cardiette ar 1200 advantage

Walking path mark Technogym I shape Runrace HC 1200

Blood Analyzer of lactato (complete blood) portable mark YSI Sport shape 1500 L-230V with standards of calibration of 5 milimoles.

Analyzer of pH, gases and blood electrolytes mark Radiometer model ABL 77

Results and conclusions: The increase of the Anion GAP during the test is significant only in the placebo group, probably due to the major decrease of the bicarbonate during the test. This little variation of the parameter during the test when seawater is consumed demonstrates what has been commented previously on bicarbonate.

As a summary, we might say that the continuous seawater intake neutralizes the slight metabolic acidosis generated by the production of lactic acid during the submaximal physical exercise, thanks to its content in bicarbonate, which explains the increase of the pH and the maintenance, without any significant modification, of the Anion GAP.

Key words: Seawater. Anion Gap. Bicarbonate.

Modifications in oxidative damage in sportsmen after docosahexaenoic acid ingestion

López FJ, Luque AJ, Martínez AB, Contreras CJ, Villegas JA

Department of Exercise Physiology. San Antonio Catholic University (UCAM). Murcia. Spain

Background: Currently, the carried out studies in humans show a n3 fatty acid deficit made clear in plasma data, platelet membranes and tissues from autopsy. Endurance exercise causes an increase of the oxidative action on DNA. One of the more frequent injuries is the deoxyguanosine hydroxylation in the C8 position, which results in the 8-hydroxy-deoxyguanosine (8-OHdG) formation. The aim of our study is to analyze the effects of DHA ingestion on oxidative damage and performance in sportsmen after ingesting triglyceride structured with docosahexaenoic acid (DHA) at position 2, in a 2,1 g/24 h dose for 3 months.

Methods: 18 cyclist men have been randomly selected. Each cyclist performed 5 ergometric endurance tests in 3 months (2 maximal triangular endurance tests

ORAL COMMUNICATIONS

and 3 rectangular endurance tests of 90 minutes to 70% maximum oxygen consumption). After performing the first tests, cyclists ingested 2,1 g/day of DHA. DNA and lipids oxidative damage analysis and performance evaluation by means of variable observation at ventilatory threshold 2 (VT2) was carried out.

Statistical Analysis: Clinical trials. For the comparison of variables ANOVA was done for repeated measurements with an intra-subject factor (DHA-A consumption time) and an inter-subject factor (sporting level).

Results: The DHA continuous ingestion above 3 weeks causes a total plasma antioxidant capacity increase ($p < 0,05$), a decrease of damage on DNA ($p < 0,035$) and lipids ($p < 0,05$). On the other hand, power, cardiac frequency and VO_{2max} percentage at VT2 increase. Finally, glycemia decreases less during the endurance test that is performed at the end of the trial ($p < 0,001$).

Conclusions: The union of the effects of oxidative damage decrease, performance increase and normoglycemia during an endurance effort are not expected results and not known in previous researches. Since the done previous studies with n3 fatty acids (eicosapentaenoic and docosahexaenoic mixtures) do not shown a relationship between ingestion and a performance improvement, in this sense we do think that our discovery is due to the specific action of the studied fatty acid.

Key words: Oxidative damage. Docosahexaenoic.

Performance improvement in sportsmen after docosahexaenoic acid ingestion

López FJ, Luque AJ, Martínez AB, Contreras CJ, Villegas JA

Department of Exercise Physiology. San Antonio Catholic University (UCAM). Murcia. Spain

Background: Currently, the carried out studies in humans show a n3 fatty acid deficit made clear in plasma data, platelet membranes and tissues from autopsy. The aim of our study is to analyze the effects of DHA ingestion on performance in sportsmen after ingesting triglyceride structured with docosahexaenoic acid (DHA) at position 2, in a 2,1 g/24 h dose for 3 months.

Methods: 18 cyclist men have been randomly selected. Each cyclist performed 5 ergometric endurance tests in 3 months (2 maximal triangular endurance tests and 3 rectangular endurance tests of 90 minutes to 70% maximum oxygen consumption). After performing the first tests, cyclists ingested 2,1 g/day of DHA. Performance evaluation by means of variable observation at ventilatory threshold 2 (VT2) was carried out.

Statistical Analysis: Clinical trials. For the comparison of variables ANOVA was done for repeated measurements with an intra-subject factor (DHA-A consumption time) and an inter-subject factor (sporting level).

Results: The DHA continuous ingestion above 3 weeks causes power, cardiac frequency and VO_{2max} percentage at VT2 increase. Finally, glycemia decreases less during the endurance test that is performed at the end of the trial ($p < 0,001$).

Conclusions: The union of the effects of performance increase and normoglycemia during an endurance effort are not expected results and not known in previous researches. Since the done previous studies with n3 fatty acids (eicosapentaenoic and docosahexaenoic mixtures) do not shown a relationship between ingestion and a performance improvement, in this sense we do think that our discovery is due to the specific action of the studied fatty acid.

Key words: Performance. Improvement. Docosahexaenoic.

NUTRITION AND SPORTS SUPPLEMENTATION- I LANGUAGE: ENGLISH

Effects of beer intake on rehydration parameters compared with water alone

Jiménez-Pavón D^{1,2}, Romeo J³, Cervantes-Borunda M⁴, Artero EG¹, España Romero V¹, González-Gross M^{1,2}, Marcos A³, Castillo MJ¹

¹EFFECTS-262 group, Department of Medical Physiology, School of Medicine, University of Granada, Granada, Spain;

²Department of Health and Human Performance, Faculty of Physical Activity and Sport Sciences-INEF, Universidad Politécnica de Madrid, Spain; ³Immunonutrition Research Group, Department of Metabolism and Nutrition, Consejo Superior de Investigaciones Científicas, Madrid, Spain; ⁴Facultad de Educa-

ción Física y Ciencias del Deporte. Universidad de Chihuahua, México.

Introduction: Beer is characterized for its low alcoholic content and notable amount of low molecular weight maltodextrins, amino-acids, minerals, B group vitamins, anti-oxidants, and carbohydrates. Hence, moderate intake of beer could be an alternative in the restoration of fluid balance after exercise-induced dehydration.

To determine the effectiveness of beer intake in restoring fluid balance after exercise-induced dehydration compared with water

Material and methods: In a cross-over study design, sixteen healthy male volunteers (age: 21.1 ± 1.4 years, VO_{2max} : 55.9 ± 3.6 ml·min·kg⁻¹), all of them moderate consumer of alcoholic beer, performed two randomized trials separated by a 3 weeks interval. In each trial the subjects exercised at 60% of maximum aerobic speed in hot environment (35 ± 1 °C, 60 ± 1 % rh) during 60 minutes. After the exercise bouts, the subjects rested for 2h in a separate chamber at the same environmental conditions and were asked to drink 660 ml of beer plus water ad libitum (trial B+W) or only water (trial W). The subjects were weighted before and after exercise, and also after the 2h period of rehydration. Additional measured variables included fat free mass (measured by dual-energy x-ray absorptiometry), percentage of change in plasma volume and thirst scale. Urine volume and fluid intake were collected during the rehydration period.

Results: After the exercise bouts, a mean decrease of 2.4 ± 0.3 % of body weight was observed ($p < 0.001$), together with a decrease in fat free mass ($p < 0.001$) and plasma volume ($p < 0.001$), and an increase in thirst score ($p < 0.001$). During the rehydration period, there were no significant differences in the amount of fluid intake between trials (1620 ± 587 vs 1644 ± 620 ml in B+W and W, respectively, $p = 0.91$). The urine volume was also similar in both trials (281 ± 374 vs 223 ± 245 ml, in B+W and W, respectively, $p = 0.70$). After two hours of rehydration, the subjects significantly recovered 1.3% and 1.6% of body weight in B+W and W trials, respectively ($p < 0.001$) without differences between the kind of rehydration ($p = 0.29$). Fat free mass and plasma volume increased significantly after the rehydration period in both trials (fat free mass = 0.9 ± 1.6 % vs 1.4 ± 1.2 %; plasma volume = 3.3 ± 5.2 % vs 5.1 ± 7.9 % in B+W and W, respectively, all $p < 0.01$) and thirst score decreased at pre-exercise levels.

Conclusion: Although in both exercise bouts, thirst perception appeared not to be of enough intensity for stimulating voluntary drinking until recovering full body weight losses, the results of the present study suggest that beer could be a rehydration beverage as effective as water as after exercise under hot environment in healthy moderately trained young adults. It is important to highlight that this message related to the benefits of moderate consumption of alcohol have always been addressed to adult population.

Financial support: Centro de Información Cerveza y Salud.

Key words: Rehydration. Hot environment. Exercise.

Acute effects of a carbohydrate-protein sports drink on performance in swimmers

Vandenbogaerde T¹, Hopkins W¹, Talbot S²

¹Institute of Sport and Recreation Research New Zealand, AUT University, Auckland, New Zealand. ²North Shore Swim Club, Auckland, New Zealand

Researchers have demonstrated that consumption of carbohydrate-protein-electrolyte solutions during prolonged endurance exercise enhances performance, but the effects of these supplements on short-term swim exercise are unclear.

Purpose: To quantify the effects of carbohydrate-protein-electrolyte supplementation on performance, ratings of muscle soreness and ratings of coping with exercise in swimmers.

Methods: In a double-blind randomized crossover with a 1-wk washout, 13 highly-trained swimmers (6 females and 7 males; age 17-23 y) consumed either carbohydrate-protein-electrolyte or non-caloric flavored water before and during an incremental 7x200-m step-test, and 10 min before a 100-m time-trial 24 h later. Diet and training were standardized. Earlobe blood samples were taken to measure lactate and glucose concentrations. We also assessed subjective ratings of soreness and coping with exercise. We used magnitude-based clinical inferences for effects on performance and subjective ratings, and mechanistic inferences for effects on lactate and glucose concentrations.

Results: The supplement had clinically clear performance effects that were potentially harmful and unlikely to be beneficial: time in the last step of the step-test, 0.9% (90% confidence limits ± 2.0 %); lactate-threshold time, 0.2% (± 1.3 %); and 100-m time-trial time, 0.1% (± 0.6 %). The supplement increased blood

glucose moderately in the step-test, by 7.4% ($\pm 4.0\%$). Effects of the supplement on muscle soreness and coping with exercise in the step-test and time-trial were possibly harmful and very unlikely to be beneficial.

Conclusion: The carbohydrate-protein-electrolyte supplement should not be used in short-term swim performance tests or races.

Key words: Athlete. Lactate threshold. Nutrition. Test. Time-trial.

Effects of pre-exercise meals on glucose kinetic before and during moderate exercise

Marins J, Altoé J, Silva R, Ferreira F, Makkai L, Reis F

Universidade Federal de Viçosa. LAPEH. Minas Gerais. Brasil

Introduction: The process of fatigue during prolonged aerobic exercise is related with many factors, including, the serum glucose level.

Objective: Our purpose was to evaluate the glycemic response before and during a moderate exercise performed after consuming three types of "breakfast": mix meal (BF1); 400 mL carbohydrate drink (BF2); and no previous meal (BF0).

Methods: Fifteen healthy male aged 23.4 ± 2.2 , ran at a steady-state on a laboratory treadmill during 1 hr in comfortable environmental condition with intensity range from 70 to 80% of the subject's previously determined VO_{2max} [57.3 ± 3.4 mL (kg. min)⁻¹]. One of the main trials was performed as soon as the volunteers arrived on the laboratory after a night of fasting and no pre-exercise meal was ingested (BF0). In another trial, a mix "breakfast" with 400 kcal was offered (BF1) and it was composed by a cereal bar (Nutry®), a bag of salt biscuit "Pit Stop" (Marilan®), an industrial orange juice "Kappo" (Coca Cola®), and a common apple (100 g). The 100 kcal "breakfast" trial (BF2) was composed by only 400 mL of a CHO drink (Gatorade®).

Results: The glycemia was measured at rest, right before the volunteers to intake one of the meals and each 15 min thereafter until to complete 1 hr. During exercise, glucose was analyzed at the same interval of time (15, 30, 45 and 60 min). Lactate, heart rate, blood pressure and ratings of perceived exertion are also evaluated. Means \pm SE Blood glucose concentration are shown in Figure 1.

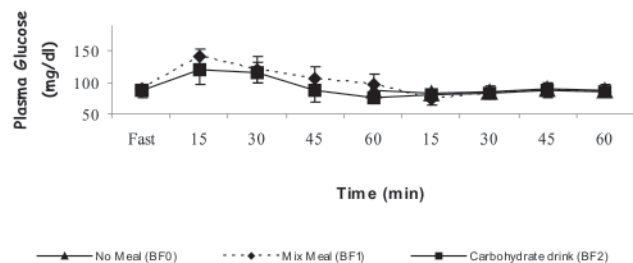


Figure 1. Marins, J. *et al.* Blood glucose concentration (mg/dl) before and during exercise in no meal (BF0), mix meal (BF1) and carbohydrate drink (BF2) trials. (N = 15 M \pm SEM)

Glycemia at rest increased significantly ($p < .05$) more (15, 45 and 60 min) in BF1 than in BF2 and at 15-min exercise, it was more elevated in BF0 than in BF1 ($p < .01$). There was no statistic difference in the blood glucose between 30 and 60-min exercise. There was no register of hypoglycemic symptoms in any period of time, even when the subjects performed exercise in the state of fasting.

Conclusions: All the meals were effective in the maintenance of the blood glucose in normal levels and the practice of exercise after an overnight fast did not cause hypoglycemia.

FAPEMIG – ¹CNPq.

Key words: Metabolism. Glycemia. Hydration. Sport nutrition.

Alternative approach on the rugby players' diet

Popescu Alin Nicolae¹, Bara Laura Margareta², Vasiliu George³

¹Medical director Romanian Rugby Federation; ²Doctor Romanian national rugby team; ³Physicist, consultant in optimizing the nutritional calculation

We elaborated a personalized diet, taking into consideration the weight groups of the rugby players, with the help of an original calculation program system.

We managed to optimize the somatic parameters of the players and implicitly their performance.

This research took about 8 month, from December 2007 until July 2008 on a group of 36 players' components of the Romania national rugby team.

There was evaluated the complete and personalized nutritional necessary, using the somatic parameters of the players related to their position in the field, and the ideal somatic parameters. There were calculated the RMB (BMR – Basal Metabolic Rate) based on the Mifflin model and taking into consideration the effort factors and the Thermal Effect of Indigestion (TEF – Thermal Effect of Feeding) and it was calculated the Total Energy Expenditure (TEE). Also, using the specific distributions of the high-performance athlete in the team – sports with mixed type of effort (aerobic and anaerobic) for macro and micro – nutrients – DZR (RDA – Recommended Dietary Allowance), in the end, we established the complete and personalized nutritional necessary for players, components of a group of athletes that can be selected for rugby.

The software analysis evaluates and points out the necessary corrections in order to establish a menu that corresponds to the specific personalized requests.

Key words: Rugby. Nutritional necessary. Optimization. Calculation software.

A probiotic fermented dairy product improves clinical outcome of common infections and life quality in stressed adults

Wang X-F, Niborski V, Tanguy J, Borgiès B, Jost D, Ernouf C, Le Dref P
Danone Research, France

Introduction: It is well recognised that physically stressful heavy exercise suppresses the functioning of the immune system, and consequently an increase in frequency and in severity of infections is very common after intense, long-term exercise. Probiotics may provide a suitable dietary intervention to counteract this stress-induced susceptibility. Our aim was to assess the effect of Actimel®, a fermented dairy drink containing the probiotic organism *Lactobacillus casei* DN-114 001, on infections in physically and mentally stressed healthy adults.

Methods: A double-blind, randomised, controlled trial was conducted in 239 volunteers undertaking Fireman training, a model representing a situation where multi-stressors such as lasting exercise, sleep deprivation, and psychological pressure may be combined. Volunteers received 200g of Actimel® (N=118) or the control product (N=121) daily for seven weeks. The incidence, duration, severity, and type of common infectious diseases (CIDs) experienced were recorded. A Quality of Life (QoL) questionnaire SF-36 was assessed at 3 time points: baseline, 4 weeks, and study end (7 weeks).

Results: Although volunteers consuming Actimel® did not experience a significantly lower number of CIDs than the control group (32 vs. 38, $p=0.725$), in volunteers experiencing CIDs infections were of a shorter duration with the active product compared to the control product (3.00 vs. 4.00 days, $p=0.046$). Furthermore, Actimel® consumption had a beneficial effect on QoL, improving social functioning for all volunteers ($p=0.005$) and bodily pain for volunteers experiencing CIDs ($p=0.013$) in both the ITT population and PP population. The study products were ingested in accordance with the study protocol and compliance was good. There were no serious adverse events and clinical safety was excellent.

Conclusions: Actimel® demonstrates a beneficial effect on relieving infection in individuals experiencing physical and mental stress during intense training. Individuals regularly consuming Actimel® not only had a shorter duration of infection compared to individuals consuming the control product, but also had perceived improvements in some dimensions of QoL. Daily consumption of Actimel® was shown to provide health benefits to healthy adults during a heavy physical training and psychological stress situation and thus it may be of interest in similar populations such as athletes undergoing intensive training periods.

Key words: Probiotic. Infection. Stress. Physical training.

NUTRITION AND SPORTS SUPPLEMENTATION-II LANGUAGE: ENGLISH

Nutritional profile of a group of young soccer players: reminder of 24 h

Moreno C, Martínez P, Martínez S, Tauler P, Aguiló A

Grupo de Investigación de Estilos de vida y salud. Universitat Illes Balears. Palma de Mallorca, España.

ORAL COMMUNICATIONS

Table 1. Moreno C. *et al.*

	Media \pm (standard error)
E (Kcal)	2398.6 (60.51)
E (Kcal)/kg of weight	47.5 (1.8)
Proteins (g)	109.7 (3.7)
% E in proteins	18.56 (0.46)
% animal Protein	69.68 (1.35)
% vegetal Protein	30.32 (1.35)
% E in carbohydrates	44.09 (1)
% complex C.Hydrates	59.70 (1.37)
% simple C.Hydrates	40.30 (1.37)
% E in lipids	37.34 (0.92)
% SFA	39.46 (4.07)
% Mono UFA	42.10 (3.99)
% Poly UFA	18.60 (1.18)
cholesterol (mg)	416.91 (23.47)
nutritional fiber (mg)	18 (0.79)

Introduction: Suitable nutritional state is a priority factor for the professional development of sportsmen. Food that is included in a sport diet has three basic objectives: to provide energy, to assure tissue fortification and repair and to maintain and regulate the metabolism. Diet in sport practicing must include between 55-65% of the total energy in carbohydrate form, between 12-15% of proteins and less of 30% of fats¹. The recommended rank for soccer players is between 3819 and 5185 kilocalories².

Material and Method: A reminder of 24h of foods and drinks that ate the previous day questionnaire was made to 97 soccer players. The players present the following profile, 15,7 \pm 0.62 years old with an average weight of 55,1 \pm 1.6 kg., a height of 1,85 \pm 0,15 cm and a corporal mass index of 20,4 \pm 0,36.

Results: The results of the reminder of 24h show us that the ingestion average of kcalories is 2398 \pm 60,51, with a kcal average of 47,5 \pm 1.8. per kg. of weight, with the following distribution of macronutrients: 18.5% proteins, 44.1% of hydrates and 37.4% of lipids (Table 1).

Conclusions: The distribution of the caloric ingestion between the different meals is inadequate, a high percentage of soccer players does not have breakfast and the majority have between 3 and four meals per day.

An important deficit of Kcalories (- 1,420, 4) is shown, with a low percentage(15% less) of the carbon hydrate, and an excess of lipids (more of a 10%) in the in the total energy ingestion.

It would be advisable that young people increased the ingestion of carbon hydrates, decreasing the lipids intake.

It also would be suitable an increase of the fish consumption and vegetables.

References:

- Clark K. Nutritional guidance to soccer players for training and competition. *Journal of Sports Sciences* 1994;12(S):S43-50.
- Leblanc JC, Gall FL, Grandjean V, Verger P. Nutritional intake of french to soccer players AT the Clairefontaine Training Center. *International Journal of Sport Nutrition and Exercise Metabolism* 2002;12:268-80.

Key words: Sport nutrition. Diet in soccer players. Nutritional profile.

Nutritional profile of amateur young swimmers: gender differences

Tauler P^{1,2}, Martínez S^{2,3}, Pasquarelli BN⁴, Moreno C^{2,3}, Romaguera D², Arasa C³, Aguiló A^{2,3}

¹Departament de Biologia Fonamental i Ciències de la Salut. Universitat de les Illes Balears. Palma de Mallorca. Spain. ²Grup de Recerca Estils de Vida i Salut. Universitat de les Illes Balears. Palma de Mallorca. Spain; ³Departament d'Infermeria i Fisioteràpia. Universitat de les Illes Balears. Palma de Mallorca. Spain; ⁴Centro de Excelência Esportiva. Universidade Estadual de Londrina (CENESP/UEL). Brazil.

Nowadays, young athletes are subjected earlier to high intense training programs and competitions, which involve the need of getting good performance

at the same time health level is maintained at a good standard. Adolescent athletes require specific nutritional support in order to maintain normal growth and physiological maturation as well as to cope with athletic performance. The aim of this study was to evaluate the nutritional profile of adolescent swimmers belonging to semi-professional teams. Thirty-six caucasian adolescent swimmers (22 boys and 14 girls) participated voluntarily in the study. Dietary intake and clinical biochemical parameters were determined. Energy intake, as well as protein intake, per kg of body weight was significantly higher in males compared to females. On the other hand, females showed significantly greater polyunsaturated fatty acids intake compared to males. Energy as well as carotenes, vitamin A, vitamin E, vitamin D and folic acid intakes of males and females were below to their requirements. Women showed also inadequate intakes of iron and calcium. Oppositely, protein intake doubled the requirements of the study population. Serum iron and cholesterol related parameters were within the normal range for healthy people and no differences were found between genders. In conclusion, young swimmers participating presented low average total energy intake, excessive protein intake and lower intake of several micronutrients in both genders.

Key words: Adolescent swimmers. Gender. Dietary intake.

Dietary intake in track and field athletes during a competitive training period

Sillero-Quintana M, García-Aparicio A, Torres-García A, Garrido-Pastor G
Faculty of Physical Activity and Sport Sciences-INEF (U.P.M., Spain)

Introduction: Optimal nutrition contributes to achieve maximum sport performance. In competitive period, athletes have to get the right amount of energy and ensuring an adequate intake of micronutrients. Purposes of this study were to analyse dietary habits in female (F) and male (M) elite athletes during a competitive period. We hypothesize that Spanish athletes do not intake a healthy and adequate diet.

Subject and methods: Sample included twenty Spanish elite athletes (Table 1). Diet composition was estimated by food weighing (Mettler-Toledo, 0.5g accuracy) for a 5 day period. During the same days, athletes completed a 24h activity questionnaire in order to estimate physical activity level and provide energy expenditure requirements (EER) (Food and Nutrition Board, 2006).

Results: Energy intake and EER were higher in male than female athletes (Table 2). Absolute intake (g/day) for carbohydrates and lipids were also higher in the male group.

Cholesterol intakes were higher than maximal suggested in both groups. Micronutrient intakes were suboptimal (Food and Nutrition Board, 2006) for vitamin-E

Table 1. Sillero-Quintana, *et al.* Basic anthropometric and training data

	Age (yr)	Weight (kg)	Height (m)	BMI (kg/m ²)	Training (h/wk)
F (n=8)	19.9 \pm 2.1	56.4 \pm 7.1	1.71 \pm 0.04	19.3 \pm 1.7	14.3 \pm 4.7
M (n=12)	23.4 \pm 2.7	68.5 \pm 11.4	1.79 \pm 0.07	21.3 \pm 2.2	16.4 \pm 3.3

Table 2. Sillero-Quintana, *et al.* Energy intake (EI), Estimated Energy Requirements (EER), Carbohydrates (CH), Proteins (P) and Lipids (L) intakes (percentage, absolute values and relative to body weigh)

		F (n=8)	M (n=12)
EI	(kcal/d)	2306 \pm 381**	3209 \pm 700
	(kcal/kg)	41 \pm 4	47 \pm 9
EER	(kcal/d)	2191 \pm 218***	3030 \pm 472
	(g)	305 \pm 165*	405 \pm 99
CH	(g/kg)	5.4 \pm 0.9	5.9 \pm 1.3
	(%)	23 \pm 5	20 \pm 4
P	(g)	143 \pm 40	166 \pm 59
	(g/kg)	2.5 \pm 0.7	2.4 \pm 0.6
L	(%)	27 \pm 8	31 \pm 6
	(g)	72 \pm 21**	112 \pm 35
	(cholesterol mg/d)	312 \pm 112	420 \pm 178

(57% & 65%), vitamin-D (53% & 51%), vitamin-K (87% & 79%), potassium (69% & 90%) ($p < 0.05$) and magnesium (88% & 93%) in F & M respectively. Moreover, female diet's content for folate (89%) and calcium (88%) did not reach recommendations, and the later was lower than male intake ($p < 0.01$).

Conclusions: Considering the last recommendations for competitive period (Burke, Maughan, & Shirreffs, 2007) marginal carbohydrates and elevated lipids intakes were found in both groups. Although female athletes intaked less energy and higher levels of marginal micronutrients, however, their nutrient density values were similar than in males. Female athletes have to increase calcium intakes, this aim could be got throught an increase in fortified calcium food items consumption. We think that nutritional counselling, intervention and education would be required in order to generate effective changes in the diet quality of these athletes.

References:

- Burke L., Maughan R, Shirreffs S. The 2007 IAAF Consensus Conference on Nutrition for Athletics. *Journal of Sports Sciences*, 2007;25(Supplement 1):1-48.
- Food and Nutrition Board. Dietary Reference Intakes. *The essential guide to nutrient requirements*. Washington (DC): National Academies Press. 2006.

Key words: Sport nutrition. Diet composition. Dietetic advice.

Diet followed by the Spanish wrestling team during a stay in the CAR of Sierra Nevada preparing the Olympics Games in Beijing

Mariscal-Arcas M^{1,2}, Fernández de Alba MC¹, Domingo A¹, Lahtinen J¹, Martín T¹, Moraleda L¹, Rivas A²

¹Altitude Training Centre (CAR) of Sierra Nevada (CSD), Spain;
²Dpt. Nutrition and Food Science. University of Granada, Spain.

Introduction and objective: The aimed of sport nutrition is to applied the nutritional and food science principles to improved sport performance. An optimal diet is essential to preservation the health of the athlete. Nutritional assessment of the elite sportsmen study the food consumption to determinate if the diet is adequate for a good health and the energy needs associated with training and sport. Altitude Sport training is a technique commonly used in elite sport. This is a complex technique that should be carefully prepared and planned, including diet. Sportsmen with a bad diet cannot have a good performance.

Material and method: This follow-up gathered diet data followed for the Spanish Wrestling Team in their sport stay in the CAR of Sierra Nevada preparing the Olympics Games in Beijing 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: The study population included 5 wrestler elite athletes (3 males and 2 females), mean age was 21.5yrs (SD: 2.9). Males BMI mean was 25.1Kg/m² (SD:2.2) and 24.4Kg/m² (SD: 1.8) for females. Mean of energy intake was 3832.1Kcal/d (SD:1030.8), 196.4g/d (SD:48.5) from protein, 457.3g/d (SD:153.0) from carbohydrates, 144.5g/d (SD: 41.3) from lipids for males and 3415.1Kcal/d (SD:727.1), 158.4g/d (SD: 28.9) from protein, 425.1g/d (SD: 114.4) from carbohydrates, 128.5g/d (SD: 38.3) from lipids for females. Comparison of the daily energy intake, nutrients and gender (Student's t test) showed not significant differences. There is no correlation between BMI and energy consumption.

Conclusion: The study population has a similar nutritional intake. We don't find different for wrestler males and females. These athletes are conditioned by the weight competition and should be considered for the nutritional planning.

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: Wrestler. Diet. BMI.

SPORTS CARDIOLOGY-I LANGUAGE: SPANISH

Analysis of pNN50 and pNN20 in healthy subjects and cardiac patients at rest and exercise

De la Cruz Torres Blanca, Algaba del Castillo Jose, Naranjo Orellana José
Centro Andaluz de Medicina del Deporte de Sevilla

Table 1. De la Cruz Torres Blanca, et al. Average and standard deviation values of age, height, weight, resting heart rate, systolic and diastolic blood pressure

Variable	Age	Height	Weight	H.R.r	S.B.P.	D.B.P.
Average±	23.5 ±	170.4 ±	68.3 ±	66.5 ±	117.2 ±	72.6 ±
S.D.	4.3	9.5	12.9	10.9	12.7	9.3

Table 2. De la Cruz Torres Blanca, et al. Resting electrocardiographic abnormalities. Only shown those with prevalence higher than 1%. NORMAL: Normal ECGr pattern, RBBB: right bundle branch block, DXR: dextrorotation, LVH: left ventricular hypertrophy

Diagnosis	%
Normal	48.5
Incomplete RBBB	26.6
Sinus bradycardia	17.6
Secondary ST-T alterations	12.5
DXR	11.5
Nonspecific ST-T alterations	10.1
LVH	6.9
Others	3.9
Sinus arrhythmia	2.4
RBBB	1.6

Introduction: pNN50 is an useful parameter in a heart rate variability (HRV) analysis, in the diagnosis as in the prognosis. However, Goldberger, et al (2002) showed this analysis is more sensitive and significative when you use pNN20. The objective of this study is to analyze HRV at rest in healthy people and in patients with acute myocardial infarction (AMI) and how does it change during aerobic exercise with pNN50 and pNN20.

Material and method: The heartbeat signal was recorded beat to beat during 15 minutes at rest and 15 minutes while pedalling at submaximum intensity in 10 healthy and active men and 10 cardiac patients. pNN50 and pNN20 were calculated.

Results: At rest, cardiac patients had a pNN50 of 1,71±2,24 and during exercise of 0,48±1,02, while healthy subjects had a pNN50 of 12,18±5,68 y 0,32±0,33 respectively. The value of pNN20 of cardiac patients was 21,28±15,24 at rest and 10,10±14,03 during exercise while healthy subjects had a pNN20 of 34,40±10,60 y 1,02±1,15 respectively. In both groups, values of pNN50 and pNN20 decreased from rest to exercise but this decrease was more sensitive in pNN20. The same way, if we compared the difference from rest to exercise between both groups, the value of pNN20 was lower than pNN50 (0,000153 y 0,001020, respectively).

If we analyze the behaviour of both parameters from rest to exercise, with pNN50 it's not possible to differentiate between healthy subjects and cardiac patients either at rest or during exercise, while with pNN20 it is possible.

Conclusion: statistical analysis of HVR with pNN20 is more sensitive than with pNN50.

Key words: Variability heart rate. pNN50. pNN20. Exercise.

Resting electrocardiographic findings in university athletes

Fernández M, Álvarez A, Pascual L, Jiménez J, Salamanca C, Alameda L
Sport Medical Unit. Sports Activities Service. University of Seville
(UMD-SADUS)

The usefulness of resting electrocardiography (ECGr) in Sports Medicine it is well known, in order to detect cardiovascular abnormalities and thus prevent sudden death or progression of disease.

This study is focus on the electrocardiographic events found out in medical evaluation of university athletes, performed at UMD-SADUS.

All data were collected in a specifically designed database and analysed with Excel and SPSS.

General characteristics of the population (n: 1073) are shown in Table 1, and type and number of electrocardiographic findings in Table 2.

A normal ECGr pattern is the most frequent event (48, 6 %). Nevertheless, we want to highlight three electrocardiographic abnormalities between all those

ORAL COMMUNICATIONS

found out. Incomplete right bundle branch blocks (28,5%), sinus bradycardia (17,6%) and left ventricular hypertrophy (6,9%). These three abnormalities, that can be seen isolated, are frequently associated, followed by ST-T alterations. In fact, alterations of the ventricular depolarisation, secondary (12,5%) or no specific (10,1%) ones, are another frequent ECG abnormalities, contrarily we haven't detected cardiac ischemic alterations. In conclusion, the studied population showed, in number and type, similar ECG abnormalities to those reported by others authors.

Key words: Resting electrocardiography. ECG abnormalities. Sports Medicine.

Cardiac structural pathology in competitive sportsmen subjected to echocardiography: a 6 year experience

Trujillo Francisco¹, Fernández-Vivancos Carla², Pedrosa Valle², Fernández-Armenta Juan², García de la Borbolla Mariano², Castro Antonio², Cruz José M²

¹Andalusian Centre of Medicine and Sports, Seville, Spain;

²Department of Cardiology, Virgen Macarena University Hospital, Seville, Spain

Objective: To value the utility of transthoracic echocardiography as a screening method to rule out pathology in high level athletes.

Methods: We present a series of 624 echocardiographies performed between 2002 and 2008 among a total of 4822 high level athletes studied in this center of Sports Medicine. All the studies were realized by the same observer with the same equipment.

Results: Of the 624 echocardiographies made, 25% were women (20±7 years) and 75% were men (26±10 years). 256 (41%) were routine studies while 368 (59%) were done because of findings in the anamnesis, physical exam or ECG. 570 (91.3%) were normal, 33 (5.2%) presented data of structural cardiopathy and 21 (3.3%) were in a grey zone. Of this last group, 76% were left ventricle concentric hypertrophies between 12-15 mm with all the rest of the parameters normal and 24% presented apical hipertrabeculation as the only finding. All the subjects within the grey zone were men. Among the group of pathological echocardiographies, 7 (21%) were hypertrophic cardiomyopathies and 26 (79%) were valvulopathies (3 of them were aortic subvalvular stenosis due to a membrane, 7 mitral valve prolapse, 15 bicuspid aortic valve and 1 aortic valve prolapse). The majorities of the valvulopathies (79%) were asymptomatic and were detected randomly in the echocardiography or after the discovery of a heart murmur during a routine physical exam. Only 6 athletes presented a significant valvulopathy. 11 sportsmen (1.7%) were separated from the regular sports practice due to the results of the echocardiography, 7 of them with hypertrophic cardiomyopathy, 2 aortic subvalvular stenosis and 2 with significant aortic insufficiency. No one in the grey zone was separated from sports practice and all of them were actually free of symptoms.

Conclusion: Echocardiography is a useful technique for the screening of certain pathologies which present a risk for the sports practice. Among these pathologies are hypertrophic cardiomyopathy and valves diseases. All the athletes in the so called grey zone continued the sports practice without incidences. These borderline alterations could simply be explained by an exaggerated adaptation of the heart due to continued exercise.

Key words: Sports cardiology. Athlete screening. Preparticipation screening. Echocardiography.

Responses of n-terminal pro brain natriuretic peptide and cardiac troponins to sporadic exercise in sedentary subjects

Fernández-Armenta Juan¹, Pedrosa Valle¹, Trujillo Francisco², Fernández-Vivancos Carla¹, Sánchez-Tembleque Claudio¹, Carranza Dolores², López de la Osa Manuel², Cruz José M¹

¹Department of Cardiology, Virgen Macarena University Hospital, Seville, Spain; ²Andalusian Centre of Medicine and Sports, Seville, Spain

Background: N-terminal pro brain natriuretic peptide (NT-proBNP) and cardiac troponin T are good markers of wall stress and myocardial injury. Their capacity to predict potential injury in subjects with cardiopathy is well known. The elevation of these biochemical parameters it has been related to strenuous exercise in

competitive athletes, with an unclear meaning. The data of cardiac injury seem greater in less active subjects. The behaviour of these specific parameters of the heart in non-active subjects who make sporadic exercise has been less studied.

Objective: To evaluate the response of troponin T and NT-proBNP in non-active subjects after a seven-soccer match.

Methods: Sixteen sedentary males (age range 25 – 56 years) were exercised in a play football match. Heart rate, arterial pressure, body mass, abdominal perimeter were recorded. ECG was performed. Blood samples were collected from each subject before and immediately after the soccer match. Levels of NT-proBNP, cardiac troponin T, creatinine kinase, lactic acid, urea and creatinine were measured.

Results: 6 of 16 participants (37,5%) showed NT-proBNP levels above upper reference limits (84 ng/L) after the match. NT-pro BNP concentrations increased from 67 (SD 11,8) to 75,4 (SD 17,9) ng/L (p = 0,011) after the exercise. Levels of cardiac troponin T were undetectable in all participants. Creatinine kinase and its MB fraction were increased post-match, 125,7±51,4 to 226,9±99 (p=0,01) and 14,2±3,9 to 21,6±4,8 (p=0,02) respectively. NT-proBNP was not related to exercise-induced increases in creatinine kinase or its MB fraction.

Conclusions: Moderate sporadic exercise in non-active subjects is linked to a modest increment in levels of NT-proBNP, without an elevation of cardiac troponin, which can expose a physiological process.

Key words: NT-proBNP. Troponin. Sports cardiology. Exercise. Myocardial stress.

Influence of sport and season period on the dietary intake of adolescent rowers and kayakers

Reguant A, Terrados N

Unidad Regional de Medicina Deportiva del Principado de Asturias-FDM de Avilés y Dpto. de Biología Funcional, Universidad de Oviedo. Spain.

Introduction: Dietary habits of adolescent athletes could change depending on sports and nutritional advice. The purpose of the present study was to investigate dietary habits of elite adolescents from two different sports, one of them with weight limitations (rowing and kayaking) living at the same training camp and eating the same sport menus, at the beginning of a training season and at the beginning of the competition season.

Methods: 10 elite junior rowers and 15 elite junior kayakers (age: 16±1,3), were studied using a 72 hours nutritional recording (3-day food record method), and anthropometric measurements at the two periods of the season; initial training period (INIT) and competition period (COMP).

Results: Mean daily carbohydrate intake was lower than recommended, protein and fat intake was above recommended in both rowers and kayakers (43 and 45; 22 and 21; 34 and 33%, respectively). Total fat intake was above 30% in all participants, and saturated-fat intake was above 25% in all of them. Energy intake was the same at INIT and COMP in kayakers (2342±638 kcal and 2153±616 kcal), but decreased in rowers (2585±592 kcal and 1969±591 kcal) with a decrease in lipids intake and an increase in carbohydrate intake.

Conclusions: Young athletes from different sports, even following the same menus and eating at the same place, could have different dietary habits, some of them erroneous. Young rowers during the competition period decrease their energy intake, mainly through a reduction in fat intake. In young athletes training camps, not only is necessary to have supervised sports menus but also a daily eating room control. These adolescent should be encouraged to maintain their energy intake during the competition periods.

Key words: Rowing. Kayaking. Adolescents nutrition.

SPORTS CARDIOLOGY-I LANGUAGE: ENGLISH

Protocol of cardiac examination in young athletes for the prevention of sports-related cardiovascular complications

Kisko A¹, Kmec J¹, Eliasova A¹, Dernerova L¹, Uherova Z¹, Hornakova A¹, Shyp A², Kishko N², Horlenko O², Svystak V²

¹Cardiology clinic, J.A. Reiman University Hospital, Faculty of health care, Preshov university in Preshov, Slovak republic;

²Centre for sports medicine, Medical faculty, Uzhgorod national University, Uzhgorod, Ukraine

The future for prevention of sports-related cardiovascular complications in young athletes lies in continuing efforts to design more specific and efficient testing strategies. The aim of the pilot stage of the international Slovak-Ukrainian project is to elaborate an optimal protocol of the cardiac examination for young athletes and its further testing in sports cardiology practice for prevention of these complications.

The basic parts of the proposed 3-stage protocol include:

1st stage - conventional screening methods: family and personal history, physical examination, intensity of training load, blood pressure measurements, and basal 12-lead electrocardiography.

2nd stage – specific methods: subjects who have positive findings at the stage of conventional methods evaluation should be referred for additional testing, such as transthoracic/transesophageal echocardiography, ambulatory Holter electrocardiography monitoring with heart rate variability testing, ambulatory blood pressure monitoring, exercise or pharmacological testing, signal averaged electrocardiography, transesophageal atrial stimulation.

3rd stage – highly specific methods: in uncertain cases (susp. coronary fistula or other coronary arteries abnormalities, life threatening arrhythmias, etc.) coronary angiography, stress myocardial perfusion imaging, cardiac CT or MR imaging techniques and electrophysiological study may be necessary in order to confirm or rule out the suspicion of heart disease.

The proposed protocol seems to be optimal for complex cardiac examination in young athletes and is going to be tested in sports cardiology practice for the prevention of sports-related cardiovascular complications.

Key words: Sports-related complications. Cardiac examination. Protocol.

Routine ECG as a part of the pre participation screening programme: so much or so little?

Martín M, Ania JM, Carro A, Hernández E, Calvo D, García Castro M, Coto E, de la Torre A, Fernández A, del Valle M, Reguero JJ, Espolita A
Área del Corazón del Hospital Universitario Central de Asturias y Escuela de Medicina del Deporte. Oviedo. Spain

Introduction: The precise methodology by which pre-participation screening should be performed has been the source of considerable debate and controversy. The pre-screening strategy of the European Society of Cardiology (ESC) and International Olympic Committee (IOC) differs significantly from the American approach. One argument to refuse routine ECG is the probability of a high rate of false positive results.

Aim: To analyze how many additional diagnosis tests were needed following a strategy of a 12-lead rest ECG as a part of the pre-participation screening programme in a sample of players and referees of our local sports federation.

Material and methods: 1220 young athletes were included (September 2006 to June 2008) They all underwent personal and family history, physical examination and a 12-lead ECG. All those with positive criteria defined by the ESC were referred for echocardiogram or other diagnostic tests: Holter monitoring, exercise stress test or Cardiac MRI.

Results: N=1220 athletes, 226 referees, 825 football players and 169 other sports. Men 96% Medium age 23.7 ± 7 years, training time 2 ± 1 hour /day, 3.2 ± 1.4 days/week during 11 ± 4 years, 90 (7.3%) fulfilled ECG criteria described by ESC. They all underwent echocardiogram analysis: 7 were included into the grey zone (wall thickness 13-15mm with normal diameters), 1 was diagnosed of hypertrophic cardiomyopathy, another one, with suspicion of apical hypertrophy was sent for MRI, and finally, one case was considered an “athlete’s heart”. Additional studies were practised in 6 athletes: 5 cases of WPW syndrome and one of long QT syndrome who underwent exercise stress testing and Holter. So as a result, just 7.3% underwent complementary studies and 0.57% required further studies.

Conclusion: Prevalence of ECG abnormalities in young athletes is low and so it is the necessity of complementary studies. It should not be an argument for refusing the inclusion of 12-lead ECG in the pre-participation screening programme.

Key words: Preparticipation screening. Hypertrophic cardiomyopathy. Athlete’s heart.

Preparticipation screening for cardiovascular abnormalities in competitive athletes: role of 12-lead electrocardiogram

Ania JM¹, Carro A², Martín M², Reguero JJ², del Valle ME¹, Hernandez E², Espolita A²

¹Escuela de Medicina del Deporte. Universidad de Oviedo; ²Área del Corazón del Hospital Universitario Central de Asturias

Introduction: The principal objective of screening is to reduce the cardiovascular risks associated with organized sports and enhance the safety of athletic participation. The efficacy of the various athlete screening strategies is not easily resolved in the context of evidence-based investigative medicine

Objective: Our objective is to evaluate the ability of electrocardiogram (EKG) as a part of preparticipation screening strategy in a sample of players from a local federation.

Material and methods: 1052 players were evaluated from September 2006 to June 2008. In addition to medical history and physical examination, a 12 lead EKG was obtained. We followed positive criteria from European Society of Cardiology (ESC) on its consensus document (2005). Those with positive EKG criteria were referred for echocardiogram (Sonos 5500) or other diagnostic tests.

Results: N=1052 (soccer: 825; basketball: 64, handball: 26, canoeing: 46, hockey: 29, volleyball: 24, gymnastics: 11, wrestling: 8, weightlifting: 6, karate: 4, athletics: 3, swimming: 2, ball: 4). 94.9% males; mean age, 20.3 ± 4.05 years; body mass index, 23 ± 5.77. 73 players (6.9%) fulfilled EKG criteria described by ESC. EKG findings: repolarization abnormalities: 40 (ST depression, inverted T wave); voltage criteria: 5; right bundle branch block: 9; right axis: 7; left axis: 2; preexcitation syndrome: 4; ectopic ventricular complexes: 5; long QT: 1. Echocardiographic findings: interventricular septal thickness: 10.3 ± 1.3 mm (6.9-23); posterior wall thickness: 9.85 ± 1.04 (8-14). 8 players showed a septal thickness ≥ 12 mm, defined as left ventricular hypertrophy, all of them with repolarization abnormalities. 5 of them were included in the “gray area”; 2 were considered “athlete’s heart”; the last one was diagnosed of hypertrophic cardiomyopathy, confirmed by genetic testing. He was advised for discontinuation competitive sports. An exercise EKG was performed in 5 players (preexcitation syndrome and long QT), with normal findings.

Conclusion: EKG is an easy, useful and available tool in preparticipation screening, raising suspicion of clinically relevant, preexisting abnormalities. Further diagnostic testing would confirm or exclude diagnosis of hypertrophic cardiomyopathy as well as other potentially lethal conditions.

Key words: Preparticipation screening. Hypertrophic cardiomyopathy. Athlete’s heart.

Syncope and drowning during swimming race

Gomes V, Candeias R, Marques N, Silva J, Fernandez J, Jesus I
Cardiology Department of Faro’s Central Hospital, Portugal

The authors describe the case of a female patient with 17 years old with recurrent syncope. She is a swimming athlete with no relevant past medical history and as suffered several syncopal episodes since 10 months age, less than one episode a year in average. The episodes occur without premonitory symptoms and most of them appeared in relation with physical exercise, some after and others during the exercise. The last episode occurred during a swimming competition and she was rescued from the bottom of the swimming pool. She recovered spontaneously from all the episodes with feeling of cold and sweating. Physical examination was normal. Twelve lead ECG revealed sinus rhythm with normal PQ and QTc intervals and no other abnormalities. Two dimension echocardiogram with Doppler and 24 hour Holter report were unremarkable. Twelve minutes stress test with Bruce protocol until 86% predicted maximal cardiac frequency did not reveal symptoms, repolarization changes or arrhythmias. A cardiac CT scan was requested and excluded abnormalities of the coronary arteries and confirmed the absence of other morphologic alterations. At this point the patient was offered an implantable loop recorder. A week after implantation a syncopal episode occurred and the device recorded a progressive sinus bradycardia followed by two periods of asystole lasting more than 8 seconds each and separated by only two beats. A tilt test confirmed a neurally mediated syncope with a cardioinhibitory response with asystole. A double chamber permanent pacemaker was implanted in August 2008 and no syncope recurrence occurred since then.

ORAL COMMUNICATIONS

Syncope during exercise is an alert sign for a possible cardiac aetiology and a proper investigation is recommended to evaluate causes associated with risk of sudden death. This case illustrates neurocardiogenic syncope with a malignant behaviour in a young athlete that ended in a pacemaker implantation.

Key words: Syncope. Exercise. Asystole.

Drugs use to enhance sportive performances among Italian sport people

Fratini A¹, Bavazzano P¹, Liverani L², Stefani L³, Galanti G³

¹Laboratorio di Sanità Pubblica dell'Area Vasta Toscana Centro-Azienda Sanitaria Firenze; ²U.O. Medicina dello sport Az. Sanitaria Firenze; ³Medicina dello Sport Università di Firenze

Background: During sport activity, the intake of doping –drugs, is a well-known event, however the information regarding the effective prevalence in athletes are strictly limited to the elite-groups. Few are in fact the data currently available about the authentic intake among the competitive- athletes.

In this case the information usually derives from the general anamnesis and anonym clinical report and any additional evaluation has not yet been considered to better investigate this complex and wide habit. It is note in fact that non infrequently a large group of subjects that not regularly practise sport activity, takes on several substances, usually noted as doping. The aim of the study was to evaluate in a group of competitive and occasional Italian athletes the occurrence of the intake of doping substances.

Materials: Since 2004 till 2007 a champion including of 2787 urinary samples, derived from several anonym athletes, aged between 14 to 24 years, identified for sex and type of sport practised, has been screened. They were from 35 different kinds of sport. In order to identify the presence of the abuse –drugs, a urinary sample was analyzed. To detect the presence of cannabis, cocaine, opioids, the immunohistochemical method named KIMS was used. The amphetamine and the other stimulant substances were discovered with GC-MS gaschromatography method with the addition of the laboratory confirmation tools.

Results: Among the entire urinary samples analyzed, 210 (7,5%), were positive for the presence of the doping substances. Among these the metabolites of cannabis were discovered in 148 samples, the cocaine metabolites in 28, amphetamine in 6, only in 1 case ephedrine was present, in 3 samples the metabolites of nandrolon and in the rest of 24 samples the ratio of Testosterone/Epitestosterone level was inverted.

Conclusions: In young competitive - non-elite athletes the prevalence of prohibited-drugs abuse is high as previously described in elite athletes population. This is the first study evaluating this peculiar aspect in competitive non elite athletes with the inclusion of the urinary exam, in addition to the clinical report to confirm the effective intake of the substances. The health implications in future of this new approach to prevent and control this growing social problem, will need more accurate investigations.

Key words: Doping. Cannabis. Cocaine.

SPORTS CARDIOLOGY-II

LANGUAGE: ENGLISH

Adaptive hypertrophy: a five-years echo follow-up in athletes

Mercuri R¹, Toncelli L¹, Stefani L¹, Vono MC¹, De Luca A¹, Di Tante V¹, Manetti P², Maffulli N³, Galanti G¹

¹Departement of Sports Medicine, Non-invasive Cardiac Laboratory, University of Florence, Italy; ²ACF Fiorentina Florence Italy; ³Keele University England

Background: Regular physical activity determines an increase in the cardiac mass named “Adaptive or Physiological” hypertrophy. It can be concentric or eccentric, it depends on the type of training, normally appropriate to a physical exercise and reversible when sport it is discontinued. The aim of the study is to follow up for five years the effects of the physical training on the cardiac morphology in a group of soccer players.

Method: Since January 1993 to December 2005 a group of 220 athletes who have played in First League Soccer team ACF Fiorentina matched with a sedentary, has been followed with an yearly echocardiographic evaluations. The soccer

players trained for 11 months a year, for at least 2 hours for five times in a week and a match on the Sunday. In the month of July the players made a stage of 3 weeks of 2 sessions of training including 2-3 hours daily. 46 of these athletes had a full 5 years echo-follow up evaluating aortic dimensions at root (AO_r), LVDD (left ventricle diastolic diameter), LVSD (Left ventricle systolic diameter), IVS (interventricular septum), PW (posterior wall) thickness and LVMi (Left Ventricular Mass index) and EF %.

Results: At the beginning of the study the Athletes showed values of the cardiac dimensions and the LVMi higher than sedentary controls (LVMi : 123,45 vs 94,36 gr/m² respectively). After five years, the athletes didn't show any modifications on cardiac dimensions and LVMi (Left Ventricular Diastolic diameter changes slightly from 52.00 ± mm to 52.90 ± mm; Left Ventricular Systolic diameter increased from 31.58 ± mm to 32.33 ± mm, Left Ventricular Mass index from 120.77 to 121.45 gr/m²; p=NS) and insignificant aortic progression of the diameter at root level (Aortic root: from 27.39 mm to 31.64 mm).

Conclusions: In athletes the LV dimensions and LVM are to the upper limits of the normal range. After five -years -follow-up all the values of cardiac chambers maintains the same dimensions and LVM remains stable. This enhance of the dimensions of the LV chamber is a normal adaptive consequence to a regular training. The physical exercise induces a mild physiological LV hypertrophy.

Key words: Cardiac morphology. Sport. Soccer players.

Features of disadaptation of cardiovascular system in patients with physical and psychoemotional strain

Bondarev Sergey

Federal State Institution “Saint Petersburg Research Institute of Physical Culture”, Russia

Introduction: This research was made to study similarities and differences of clinical and instrumental features of stress-induced cardiomyopathy as a manifestation of disadaptation of cardiovascular system to chronic physical and psychoemotional strain.

Materials and methods: Patients with diagnosis of chronic stress-induced cardiomyopathy: 55 patients experiencing mainly chronic psychoemotional stress, working as train drivers; 11 patients experience mainly chronic physical stress being high-level professional sportspersons at cyclic sports. The following tests were done: clinical examination, ECG at rest, Bruce protocol bicycle ergometry, Holter daily monitoring; echocardiography (EchoCG), single-photon emission computed tomography (SPECT) with Tc¹³¹.

Results: Status of all patients was satisfactory well. Patients of the psychoemotional stress group mainly complained on psychoemotional overstrain (65%), of the physical psychoemotional stress one – on physical overstrain (85%). ECG in both groups showed repolarization disorders (19%) as well as AV-block, paroxysmal atrial tachycardia and atrial fibrillation. Pair ventricular arrhythmia was found in physical stress patients only. Both groups did not show significant changes in EchoCG indices. However, patients with frequent ventricular arrhythmia had considerably lower time values of isovolumic relaxation period and peak E semifall of the transmitral Doppler flow indicating more significant impairment of diastolic myocardium function vs. infrequent extrasystoles. The SPECT-imaging results showed sectors with moderate to significant alteration of radiopharmaceutical uptake indicating trophic myocardial disorders in both groups. There were not found any statistically significant differences in the radiopharmaceutical uptake.

Conclusion: In general, manifestations of stress-induced cardiomyopathy caused with chronic psychoemotional or physical stress are rather similar: ECG-recorded polarization disorders, arrhythmias, EchoCG signs of impaired diastolic function, decreased radiopharmaceutical uptake at SPECT-imaging.

Key words: Stress-induced cardiomyopathy. Diagnostic algorithm. Chronic psychoemotional strain. Diastolic dysfunction of the left ventricle myocardium. Cardiac Single-photon Emission Computed Tomography (SPECT). Psychoemotional strain. Physical stress. Atrial and ventricular arrhythmia.

Sotalol treatment in athletes with atrial fibrillation

Panhuyzen-Goedkoop Nicole M^{1,2}, Smeets Joep RLM¹

¹Heart Center Radboud University Hospital Nijmegen; ²Sint Maartenskliniek-Sports Medical Center Papendal Arnhem, both the Netherlands

Sotalol is not a first choice drug in athletes to convert atrial fibrillation (AF) into sinus rhythm. There are hardly data concerning sotalol treatment in athletes.

Aim: To describe the effects of sotalol treatment in athletes with AF.

Methods: Prospective observational study during 24 month in patients (pt) referred for AF who needed rhythm control. All were treated with sotalol. Resting 12 lead ECG, exercise testing, 24 hour Holter monitoring, and echocardiography at baseline and at 1 year follow up were performed.

Results: 12 pts (11 males, 1 female), mean age 44.2 years (17-64 y) identified with AF were treated with sotalol to achieve rhythm control. There were 9 endurance athletes, 1 ex-toplevel athlete. 7 competitive athletes. All participated in sports for > 5 y, mean 5.6 hr/wk (2-12hr/wk). Five with paroxysmal AF (PAF) were treated with "pill in the pocket" method; 7 with persistent AF were treated with sotalol 120-160 mg/day. There was exercise induced AF in 10 pt (PAF in 4, persistent AF in 6) with reduced exercise tolerance in all. At follow up in the PAF group 1 pt used sotalol and deteriorated into persistent AF requiring invasive treatment. All could continue sports participation despite a paroxysm. In the persistent AF group all used sotalol 120-160mg, one was in SR after 2 weeks and 3 in SR after 3 month. 2 pt had needed invasive treatment. All could continue sports participation at a lower level. There were no side-effects.

Conclusion: Sotalol is well tolerated in athletes with exercise induced paroxysmal or persistent AF. Rhythm control with sotalol in athletes can be successful. AF has a negative influence on endurance training performance. AF in athletes is at a relatively younger age than the overall population.

Key words: Atrial fibrillation. Athletes. Sotalol.

Prevalence and long-term clinical significance of aortic root dilatation in competitive athletes

Quattrini FM, Di Giacinto B, Guerra E, Di Paolo FM, De Blasiis E, Pisciocchio C, Ciardo R, Pelliccia A

Institute of Sport Medicine and Science, Italian National Olympic Committee. Rome, Italy

Objectives: Prevalence, clinical significance, and long-term consequences of aortic root (AoR) dilatation in competitive athletes are not yet investigated. Our aim was to assess the distribution and determinants of AoR size in a large population of competitive athletes.

Methods: AoR dimension were assessed by echocardiography in 2,361 athletes participating in 48 different sports. Of them, 43 were excluded because aortic structural abnormalities, such as bicuspid aortic valve, Marfan's Syndrome, aortic prosthesis. The remaining 2,318, including 1,301 (56%) males and 1,017 (44%) females were the study population. Arbitrary cut-off of ≥ 40 mm, according to #36th Bethesda Conference, was used as upper normal limits for AoR.

Results: AoR dimension was 32.2 ± 2.7 mm (23 to 44) in males, and 27.5 ± 2.6 mm (20 to 36) in females. AoR dimension exceeded accepted upper limits in only 18 male athletes (0.8%) (Figure 1). Multivariate regression analysis showed left ventricular (LV) mass and body size explaining majority of AoR variability ($R^2=0.59$). Surprisingly, type of sport was not a determinant for AoR dimension.

The 18 athletes with enlarged AoR were periodically followed for 7.0 ± 4.2 years. None developed cardiovascular events or symptoms. Two showed progression of AoR dilatation (from 40 to 48, and 43 to 46 mm, respectively), one had incident myocarditis and one developed moderate aortic regurgitation with enlarged LV cavity.

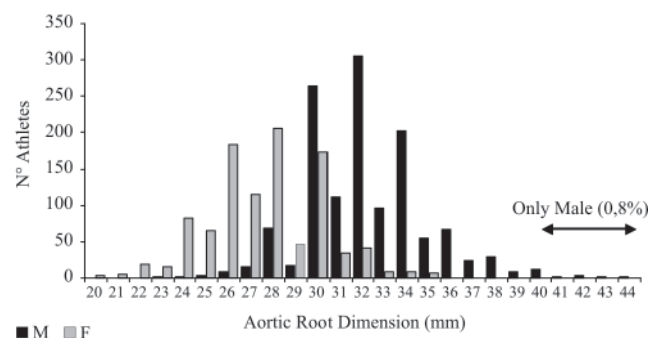


Figure 1. Quattrini FM, et al.

Conclusions: Dilated aortic root is an uncommon finding in competitive athletes and do not represent expression of physiologic cardiac remodelling of the athlete's heart. Therefore, athletes with dilated AoR deserves continued clinical surveillance (Figure 1).

Mechanical systolic time is shortened in highly trained athletes

Di Giacinto B¹, Quattrini FM¹, Emanuele G¹, Stefano Caselli², Di Paolo FM¹, Pisciocchio C¹, De Blasiis E¹, Ciardo R¹, Pelliccia A¹, De Castro S²

¹Institute of Sport Medicine and Science, Rome, Italy; ²Dept. of Cardiovascular and Respiratory Sciences, "Sapienza" University, Rome

Introduction: We sought to evaluate the systolic time duration comparatively in elite athletes and sedentary healthy controls by 3-dimensional echocardiography (3DE).

Methods: 100 athletes, engaged in endurance (n=66) and mixed disciplines (n=34) and 46 sedentary controls, matched for age, underwent 3DE examination with high frequency recording (28 ± 3 Hz). By semi-automatic analysis, volume time curves were generated; time from the beginning of the QRS complex to the minimum systolic volume (TMSV, msec) was the mechanical systole. Values of TMSV were also expressed as percent of the heart cycle (TMSV%).

Results: Heart rate was lower both in endurance (52 ± 7 bpm; $p<0.001$) and mixed disciplines athletes (55 ± 7 bpm; $p<0.001$) as compared to controls (71 ± 4 bpm; $p<0.001$).

Left ventricular end-diastolic volume was significantly higher in endurance (90.4 ± 12.6 ml/m²; $p<0.001$) and mixed athletes (75.2 ± 11.8 ml/m²; $p<0.001$) as opposed to controls (57.4 ± 10.9 ml/m²). Mild, but significant shortening of TMSV was identified both in endurance athletes (335 ± 35 msec; $p=0.01$) and mixed disciplines (320 ± 37 msec; $p=0.001$) compared to controls (354 ± 28 msec). Lower values of TMSV% were observed both in endurance ($28.8 \pm 3.4\%$; $p<0.001$) and mixed athletes ($29.4 \pm 3.5\%$; $p<0.001$) as opposed to sedentary subjects ($41.3 \pm 3.3\%$; Figure 1). Finally, TMSV showed a positive correlation with heart rate at rest ($r=0.57$; $p<0.001$).

Conclusion: Elite athletes show a mild but significant shortening of mechanical systole in comparison to healthy sedentary controls. This adaptation may explain, in addition to lengthening of diastolic time, an increased myocardial performance (Figure 1).

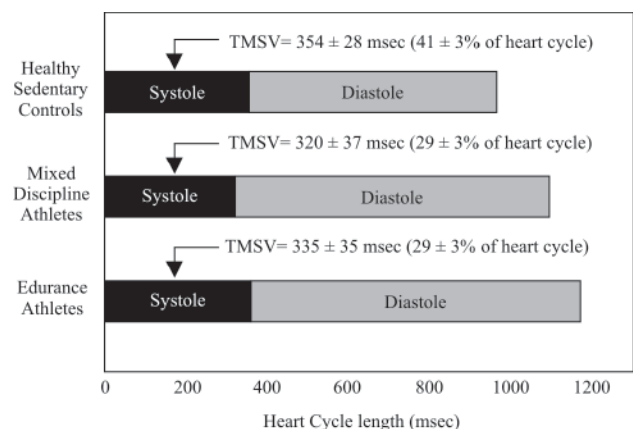


Figure 1. Di Giacinto B, et al.

Key words: 3D echocardiography. Systolic function. Elite athletes.

SPORTS CARDIOLOGY-III

LANGUAGE: ENGLISH

Post-exercise response of heart rate recovery following a maximum exercise test in amateur cyclists

Martín Aragón M, Martínez Aniz I, Ramos Álvarez JJ, López-Silvarrey Varela FJ, Segovia Martínez JC

Escuela de Medicina de la Educación Física y el Deporte. Facultad de Medicina. Universidad Complutense de Madrid

Introduction: Since the end of the 1990's, various investigative reports relate the slow decrease in the recovery heart rate after a maximal exercise test, especially during the first minute (≤ 12 beats per minute), with the prediction of sudden death related to exercise. In this work we study the behaviour of the recovery heart rate in different age groups of a general sport population of people who practice cycling.

Material and methods: The sample corresponds to 23 males with an average age of 35.4 ± 12.5 , grouped into 4 age categories and who practice non-professional cycling on a regular basis. Each individual underwent a maximum exercise test on cycle-ergometer. We applied an incremental continuous protocol (50 Watts/2 min), maintaining a constant pedaling frequency (60 y 80 rpm), determining maximum HR and in the 30 and 60 seconds of recovery. We analyzed the data using ANOVA and the Duncan Test for a 95% level of signification.

Results: Table 1: HR averages obtained.

Table 1. Martín Aragón M, et al.

	BASAL HR	MAXIMAL HR	30 SG HR	60 SG HR
Average	60.26	176.26	165.17	155.78
Typical Deviation	9.910	14.140	15.105	17.947

We did not find significant differences ($p > 0.05$), in the HR obtained among the different established age groups. The Recovery Heart Rate at 60 seconds in all age groups showed an average decrease of 20.47 ± 2.62 bpm. We found a significantly greater decrease ($p < 0.05$) in the heart rate values at 60 seconds of recovery in the group of less than 20 years old in relation to those of 20 to 40 years old.

Conclusions:

- All of the participants we studied lowered their HR in more than 12 bpm, within 60 seconds of recovery after the maximum exercise test.
- Regularly practicing cycling does not increase and may decrease the risk factor studied.
- We recommend measuring the HR recovery in the pre-participation medical examination to practice sports activity as a predictive cardiovascular risk factor during the same.

Key words: Heart Rate. Recovery. Exercise-Test.

Long-term consequences of extreme and chronic training on cardiac morphology and function in Olympic athletes

Di Giacinto B¹, Quattrini FM¹, Guerra E¹, Kinoshita N², Di Paolo FM¹, De Blasiis E¹, Pischio C¹, Ciardo R¹, Caselli S¹, Pelliccia A¹, Maron BJ³

¹Institute of Sport Medicine and Science, Italian National Olympic Committee, Rome, Italy; ²Sports Medicine Research Center, Keio University; ³Hypertrophic Cardiomyopathy Center, Minneapolis Heart Institute Foundation, Minneapolis, Minnesota, USA.

Introduction: Whether prolonged and highly-intensive athletic conditioning may be responsible for irreversible cardiac changes and/or systolic dysfunction is unresolved.

Methods: We assessed clinical profile and cardiac dimension and function in 114 Olympic athletes (89 male and 25 female; 22.1 ± 3.8 years of age), free of cardiovascular disease, engaged in endurance sports, undergoing uninterrupted training over a period of ≥ 2 consecutive Olympic Games (mean 8.6 ± 3.7).

Results: LV cavity dimension did not change (57.3 ± 4.3 to 57.5 ± 4.1 mm; ns), nor did wall thickness (10.5 ± 1.2 to 10.6 ± 1.2 mm; ns), mass index (123.80 ± 20.2 to 125.08 ± 22.3 g/m²; ns) and geometry index (0.36 ± 0.04 to 0.36 ± 0.03 ; ns). Left atrial dimensions significantly increased (32.4 ± 2.7 to 32.9 ± 3.3 mm; $p < 0.007$). Global LV systolic function was unchanged (62 ± 5 % to 63 ± 5 ; ns) and no wall motion abnormalities were observed. LV filling pattern remained within normal limits; however, atrial peak-flow velocity increased (32.3 ± 10.0 to 42.3 ± 9.4 cm/sec, $p < 0.001$), and the early-to-late diastolic ratio decreased (2.5 ± 0.7 to 1.8 ± 0.4 , $p < 0.001$).

No cardiac events occurred during follow-up; one athlete incurred myocarditis, four showed worsening of ventricular tachyarrhythmia (requiring ablation in one), and two abnormal ECG response to exercise.

Conclusion: Long term, intensive training is not responsible of progressive LV dilatation or dysfunction in healthy athletes. Left atrial enlargement may occur, likely representing a physiologic mechanism to enhance systolic cardiac function. However, prolonged athletic conditioning may not be completely benign in all individuals and may trigger clinical occurrence of ventricular arrhythmia or otherwise silent cardiac abnormalities.

Key words: Training. Cardiac morphology. Olympic athletes.

Feasibility of a training programme in basic life support and automated external defibrillation in athletes

Caballero Oliver A¹, López Servio F², Vera Vallejo C², Guerra Martín JJ², Barceló Gullón J², Murillo Cabezas F¹, Pérez Torres I¹

¹Plan Andaluz de Urgencias y Emergencias (Andalusian Plan for Urgencies and Emergencies); ²Federación Andaluza de Fútbol (Andalusian Football Federation)

Background: Sudden cardiac arrest (SCA) is a major public health problem commonly affecting young athletes. There is evidence that immediate basic life support (BLS) and early defibrillation (through automated external defibrillators: AED) improve survival.

Objectives: This paper aims to assess the feasibility of a training programme in BLS and AED within the Andalusian Football Federation (AFF).

Material and methods: A training strategy was designed in accordance with the Andalusian Plan for Urgencies and Emergencies. Some health professionals assigned to the AFF were trained in BLS and then as BLS instructors. The program was disseminated to the various AFF local entities, offering a "BLS and AED Course" to their staff consistent with the standards regulated in the Andalusian law. The courses were developed. Data were collected to analyze the results and viability of the project.

Results: The program was initiated in 2005. 25 BLS instructors were formed (20 doctors, 2 nurses, 2 physiotherapists and 1 chiropodist). They taught courses 21 for a total number of 483 providers. These ones were on average 28 years old (range: 18-62) and 15.7% were women. The courses were implemented in all provinces of Andalusia, stressing Málaga and Sevilla. 462 sports technicians were credited in the use of AED. The satisfaction surveys revealed a means of fulfilling the objectives in 98%.

Conclusion: The launch of a training programme in BLS and AED in football is feasible and well appreciated by the recipients. The programme provides first responders trained in BLS and AED. It may increase the number of victims of SCA who receive cardiopulmonary resuscitation and early defibrillation, thus improving survival of athletes suffering this problem.

Key words: Cardiopulmonary resuscitation. Defibrillation. Athletes.

Effects of sports activity in BAV athletes with mild aortic regurgitation

Stefani Laura, Mercuri Roberto, Toncelli Loira, Robertina Vono Maria Concetta, Cappelli Brunello, Galanti Giorgio

Departement of Sports Medicine, Non-invasive Cardiac Laboratory, University of Florence, Italy

Background: Bicuspid aortic valve (BAV) is a common congenital cardiac disease in general population and in athletes. Although BAV is compatible with sports activity, the impact that regular training has on the heart has not yet been investigated. We evaluated and followed up using the echocardiographic exams a group of competitive athletes with BAV.

Method: A group of 88 consecutive athletes, (average age 25 ± 11 years), diagnosed with BAV were followed from January 2000 to December 2006 with yearly echocardiographic evaluations. 30 of these athletes had a full 5 years of follow up. These athletes were matched to athletes with a normal tricuspid valve (TAV).

Results: After five years, BAV athletes showed a significant progressive increase of left ventricular dimensions: Left Ventricular End Diastolic diameter (LVEDd) changed from 50.86 ± 6.11 mm to 53.70 ± 4.84 mm; Left Ventricular Systolic (LVESd) diameter increased from 32.48 ± 5.41 mm to 34.57 ± 4.72 mm

($p < 0.001$) and also a significant yearly aortic progression of diameters at four levels (Aortic annulus: 0.78 mm/yr; Valsalva's sinus: 0.61 mm/yr; Sinus tubular junction: 0.81 mm/yr; Proximal ascending aorta: 0.98 mm/yr). In TAV left ventricle measurements did not show any significant differences after 5 years: LVEDd from 52.24 ± 4.27 mm to 52.92 ± 3.61 mm; LVEDs from 32.19 ± 3.37 mm to 32.81 ± 2.88 mm (p NS). No significant enlargement of aortic dimensions was present: AOan: 0.17 mm/yr; AOSv: 0.12 mm/yr; AOSTj: 0.21 mm/yr; PAA: 0.32 mm/yr. (Graphic 1,2).

Conclusions: In BAV athletes there a significant progressive increase in aorta and left ventricular measurements that is yet within the normal range. On the contrary in TAV athletes the progression of LV and aortic dimensions is not significance. Sports activity does not have a deleterious impact on cardiac morphology in athletes with asymptomatic BAV at least after five years of regular training.

Key words: Athletes. BAV. Echocardiography.

SPORTS INJURIES PREVENTION-I

LANGUAGE: SPANISH

Kitesurfing injuries. Prevention

Ramón Correa EA¹, Ramón Correa J²

¹MC-Mutual. Barcelona; ²Clínica platón. Barcelona

Background: The aim of our study has been the analysis of the injuries in kite-surf, sports navigation of recent appearance. In him we have sated out to value the importance of the technology equipment, the preventive measures and the nautical general recommendations in relation to the incidence of the injuries in this sport.

Methods: Are come to make a survey to the different kitesurfer of the Marine Club from kitesurf of Castelldefelds, Barcelona; with a sample size gathered of 296 kitesurfer in the period of the study from the 2002 to the 2006. the used survey gathered questions several to value different aspects in relation to the practice from kitesurf: years of experience like kitesurfer; time of practice of kitesurf weekly, monthly, annual; used preventive measures, or are of medical type or material of protection; trauma injuries: type, severity and region of the affected body; Injuries of the medical type: burn-freezing, punctures, seasickness, headaches, ocular, nasal pathology; necessity of attention urgencies of the Red Cross; necessity of attention urgencies of the recommendations that considers necessary for the practice of kitesurf; recommendations that emphasize like medical instructors of kitesurf.

Results: In kitesurf, as sport of candle and sport of shock, are of extreme importance the fulfilment of the shock, are of extreme importance the fulfilment of the different nautical norms for navigation and the use from technology equipment adapted for its practice. The kitesurfer must know perfectly all these recommendations and must have suitable technical knowledge it navigation and to able to resolve the different adversities that as it can present. If these aspects considerer all, we found that the injury index so is not elevated as it would be possible to think about a beginning, in addition most of the injuries they are included in the slight degree of affectation.

Key words: Kitesurf. Prevention.

Stabilometry and body composition analysis in professional players from different sports

Moreno R, Mendizabal S, Ramos D, Rubio JA, Jiménez F

Sports Central Investigation Unit. Sport Sciences Faculty. Castilla la Mancha University. Toledo. Spain

Introduction: Feet are some of the structures that further suffer the consequences of the practice of physical activity, for they receive directly impacts and absorb ground reaction forces. These conditions can produce significant changes, specially in high-performance sports. The study of Plantar Pressures and Its relationship to other variables such as muscle-skeletal mass and the displacement of Centre of Pressure can contribute to prevent sport injuries.

Materials and methods: 52 high-level athletes and 52 healthy subjects have been studied, with a measure of Body Composition by bioimpedance (Inbody720) and distribution of Plantar Pressures, with a pressure platform, as well as the displacement of the Centre of Pressure (Footwork-Pro). The aim of this study was to observe the relationship between Plantar Pressures distribution,

muscle-skeletal mass and displacement of Centre of Pressure in (three) different populations.

Results: We found significant difference $p < 0.05$ in MME among healthy subjects and handball, basketball and rugby. (Group handball = 50.25 kg; Group basketball = 49.4 kg; Group rugby = 46.03 kg Group Healthy Subjects = 32.07 kg). In MGC there are significant differences between rugby players and active participants. (Group rugby = 16.6 kg group and healthy subjects = 12.31 kg). Mean PP Left show significant differences exist among active players and handball and rugby (Group healthy subjects = 8.74 kg/cm²; rugby Group = 11.74 kg/cm²; Group handball kg/cm² = 13.02). Furthermore the Mean PP Right kg/cm² have also significant differences among healthy subjects and rugby and handball (Group Healthy Subjects = 8.78 kg/cm²; rugby Group = 11.81 kg/cm²; Group handball = 13.01 kg/cm²). In the Left COP exist significant differences between the healthy subjects and basketball players from rugby, handball and active, but not in Right COP. (Group active = 1.08 cm²; rugby Group = 0.59 cm²; Group handball = 1.30 cm²). Body COP, there show significant differences between rugby players and active participants. Group active = 3.51 cm² and rugby Group = 1.69 cm²).

Conclusions: High performance sport class influences body composition changes of the sample studied.

Body composition does not influence in a significant way in the centre of pressure displacement of the professional player of this study.

Training isn't a key factor to alter stabilometric parameters with regard to the healthy subjects of this study.

Key words: Body composition. Plantar pressures. Center of pressures.

Physiological, anthropometric and podiatrists characteristics in a professional basketball team

Ramos D¹, Mendizabal S¹, Moreno R¹, Rubio JA¹, Martín F^{1,2}, Jiménez F^{1,2}

¹Sports Central Investigation Unit. Sport Sciences Faculty. Castilla la Mancha University. Toledo. Spain; ²Fuenlabrada Basketball Professional Team

Introduction: The study of physiological, psychological and functional characteristics of players from different sports has been a point of interest. In basketball is no less need and there are approximations in the sport in physical and psychological terms. These decalogue has provided information on high performance athletes and has helped us detected new sport talents and to facilitate the training process at all stages.

Materials and methods: Subjects: Twelve professional ACB league basketball players took part in this study (age = 26.66 ± 5.88 years); (height = 199.59 ± 9.79cm); (weight = 98.33 ± 14.84kg).

Instruments: the anthropometrics characteristics were obtained using Seca height and a body composition analyzer by bioelectrical impedance (Inbody720). The test was conducted in a VO2max HP Cosmos Saturn treadmill with the gas analyzer CPX Ultima and Footwork Pro pressures platform was used in a plantar test.

Protocol: the data capture was made by measuring the height in the first place, then was analyzed the body composition, was continued the bipodal static test of support at key positions. To finish was made VO2max test on the treadmill until exhaustion with progressive increase in slope and speed of stadiums of a minute.

Variables: The following were obtained anthropometric measurements: height, weight, skeletal muscle mass (MME) body fat (% and Kg), body balance, intracellular water, extracellular water, proteins and minerals.

Study of plantar pressure was obtained: medium and maximum pressure planting of each foot, equidistant to the centre of pressure on both feet, and mass distribution between each foot and the treadmill test was acquired VO2max and maximum heart rate.

Results: Anthropometrics results has showed that our basketball players have a weight of 98.33±14.84 Kg, 49.4±8.38 Kg of which are muscle skeletal mass. The fat mass percentage has been 13.81%±4.24. The Table 1 shows the different body composition variables.

Physiologically, subjects has had 50.4±4.11 ml/Kg/min from VO2max and 179±9 bpm from maximum heart rate.

The plantar pressure study has showed a mean of 0.39-0.35±0.07-0.07 Kg/cm², a maximum pressure of 1.44-1.43±0.35-0.45 Kg/cm² and a weight distribution between the two feet of 51.08±5.12 and 48.92±5.12 %.

Conclusions: Across the morphologic, physiological information and the plantar analysis has defined the profile of professional basketball players.

The acquisition of descriptive data for each subject in the evaluation of functional characteristics of lower limb had provided us with values that we

ORAL COMMUNICATIONS

Table 1. Ramos D, et al. Anthropometric Characteristics of subjects

Weight (Kg)	98.33	14.84
Muscle skeletal mass (Kg)	49.4	8.38
Fat mass (%)	13.81	4.24
Extracellular water (kg)	23.96	4.02
Intracellular water (kg)	39.43	6.44
Proteins (kg)	17.04	2.79
Minerals (kg)	6.05	0.99
Right arm weight (kg)	5.29	1
Left arm weight (kg)	5.19	1.04
Right leg weight (kg)	14.24	2.56
Left leg weight (kg)	14.12	2.5
Body weight (kg)	37.58	5.79
	Mean	Desv

Table 2. Ramos D, et al. Plantar characteristics of subjects

Plantar Pressures		
Mean pressure (Kgf/cm ²) I-D	0.39-0.35	0.07-0.07
Distance of center of pressures (cm) Left	10.32-10.60	2.71-1.81
Distance of center of pressures (cm) Right	10.55-10.62	2.61-1.76
Maximum pressure (Kgf/cm ²) I-D	1.44-1.43-1.43	0.35-0.45
Balance between L-R	51.08-48.92	5.12-5.12
	Mean	Desv

normally serve as a reference to recovery of possible injuries produced during the season.

Key words: Basketball. Body composition. Plantar pressures.

Prevention in sport

Vera C, Barcelo J, Algaba J, Álvarez V

Centre for Andalusian Football Research and Development

Objectives: Detect any anomaly that could affect sporting activity in a negative way.

Material and method: Since 1995, the professional health workers linked to the health section of CEDIFA have been conducting health check-ups and studies throughout Andalusia and in all the Sports Schools linked to the programme. These check-ups were carried out not only to detect pathologies that affect spor-

Table 1. Vera V, et al.

Check-ups/studies carried out:	38.701
Most serious conditions detected:	
Systolic heart murmurs	1.334
Mitral insufficiency:	2
Kawasaki disease:	3
Intraventricular conduction:	2
Flat feet:	2.756
Arched feet:	765
Valgusism of the feet	501
Hallus Aductus Valgus:	125
Sever's disease:	546
Sclerosis:	1.098
Hunched back	82
Pendant pelvis:	1.498
Overweight:	1.683

ting activity, but also to identify aspects/conditions (flat feet, sclerosis, Sever's disease...) that may mean that a person may not be prevented from taking part in their chosen sport but may need some kind of preventive action so that the person in question does not suffer a more serious pathology in the future.

Results: Table 1.

Conclusions: The Health Check-ups and Studies Programme help to prolong the life of sports men or women and to prevent future injuries.

Key words: Prevention. Sports.

SPORTS INJURIES PREVENTION-I LANGUAGE: ENGLISH

Endurance isokinetic testing in soccer players: hamstrings/quadriceps ratio

Tourny Chollet Claire, Sangnier Sébastien

CETAPS EA 3832, Faculty of Sport Sciences, University of Rouen

Muscle fatigue and a decline in the hamstring/quadriceps ratio (H/Q) predispose the knee muscle injury. Several studies have thus examined the influence of fatigue on the conventional H/Q ratio, even though it does not fully reflect the biomechanics of joint function. Interestingly, no study has yet examined the influence of fatigue on the functional ratio. The aim of this study was determined the evolution of the balance of force in situation in fatigue. Thirty-four semi-professional soccer players were participated. They were evaluated on an isokinetic dynamometer at 180 °s⁻¹ in concentric (con) and eccentric (ecc) mode while performing 50 contractions. The torques in the Hamstrings and Quadriceps were measured every 5 repetitions. From these data collected, the conventional (Hcon/Qcon), the critical deficit (Qecc/Qcon et Hecc/Hcon) and the functional ratios (Hecc/Qcon) were calculated and termed endurance ratio.

The results indicated Hcon/Qcon were 0.69 during maximal strength test vs 0.46 after 50 repetitions for dominant leg; and 0.71 vs 0.53 respectively for non-dominant leg. In the same condition, the functional ratio Hecc/Qcon was 0.84 vs 1.66 for dominant leg and 0.84 vs 1.32 for non-dominant leg. The critical deficit was for the quadriceps during maximal strength test 1.17 vs 2.39 after 50 repetitions, and 1.19 vs 3 for the hamstrings.

The lower voluntary activation level during eccentric contractions ensures a greater reserve of fresh motor units and thus lessens muscle fatigue. This reserve can be interpreted as a defensive action to prevent damage to the musculotendinous unit. These modifications in the strength ratio, particularly in the eccentric contraction mode confirmed both the specificity of strength development in soccer training and the higher capacity to resist fatigue in eccentric mode. The increase in Hecc/Qcon after 50 repetitions, which indicated that the hamstring contractions occurred too early and too abruptly, could be the cause of quadriceps injury.

Snowboarding injuries: an analysis and comparison with alpine skiing injuries

Subirats E, Riu F, Perarnau S, Caralt X, Subirats G, Arnella M, Escolà E, Cozar J, Garcia E, Vilaró E, Cirera S

Hospital de Puigcerdà y estación de esquí y montaña de Masella

Introduction: To analyse the types of injuries associated with recreational snowboarding and to compare snowboarding injuries with those seen in alpine skiing, a sport that uses the same facilities and that has a well-documented pattern of injuries.

Material and methods: Design: Prospective case series.

Setting: The Hospital of Puigcerdà and Masella ski resort.

Patients: All people presenting to the Medical Center of Masella ski resort with an injury caused by alpine skiing or snowboarding during five ski seasons (2003-2008). Information on the patient's evolution was obtained from the hospital emergency records.

Results: A total of 9147 injuries were documented, 2789 in the snowboarders group. Of the snowboarders, 74, 3 % were male, and the mean age was 21, 9 DS: 6 years. In comparison with skiers, the percentage of beginners between injured snowboarders is bigger (49, 5% vs. 41, 5% in skiers. p<0, 01) and they are less likely in wearing helmet (37, 8% vs. 44, 9% in skiers. p<0, 01).

Significant differences were noted between the pattern of injuries in snowboarding and alpine skiing: snowboarders were less likely to have lacerations (5,8% vs. 8,5%

in skiers. $p < 0,05$), low extremity injuries (21,2% vs. 47,4% in skiers. $p < 0,05$), thumb injuries (3,2% vs. 7,8% in skiers. $p < 0,01$) and knee injuries (2,8% vs. 14,7% in skiers. $p < 0,05$) and more likely to have fractures (18,6% vs. 6,7% in skiers. $p < 0,05$), upper extremity injuries (57% vs. 29,2% in skiers. $p < 0,05$), wrist injuries (16,8% vs. 2,5% in skiers. $p < 0,05$), distal radius fractures (12,3% vs. 1,6% in skiers. $p < 0,05$), glenohumeral dislocations (2,9% vs. 1,6% in skiers. $p < 0,05$), clavicle fractures (2,4% vs. 1,4% in skiers. $p < 0,05$), and trunk injuries (2,8% vs. 2% in skiers. $p < 0,05$).

Conclusion: Snowboarding is associated with a unique pattern of injuries, the knowledge of which could influence snowboarder education, accident prevention and equipment design. Additional research is needed to understand better the types, causes and rates of injury associated with snowboarding.

Key words: Snowboarding. Injuries.

A preliminary assessment of team sports athlete's awareness of injury prevention strategies

Mohsen Ghaforian¹, Nader Rahnama², Mehdi Kargarfard³, Ebrahim Banitalebi⁴

¹Sama organization (affiliated with Islamic Azad university) - Shiraz Branch; ²Assistant professor, Physical education & Sport Science college, Isfahan University, Iran, Isfahan; ³Associate professor, Physical education department, Faculty member of humanistic sciences college, Shahrekord University, Iran, Shahrekord; ⁴Islamic Azad University of Shahrekord Branch, Iran, Shahrekord.

Introduction: The Purpose of this study was a preliminary assessment of team sports athletes' awareness of injury prevention strategies.

Method: Present research method is descriptive and survey. The research society is included all men athletes students who participate in team sports in 8th sport-student Olympiad. The sampling design is randomize. The sample is included 280 people between these people. The instrument for collecting information is the questionnaire which was done by the researcher. For data analysis inferential statistic (t- test and ANOVA) and descriptive statistic is used.

Results: The weakest awareness four team sport (handball, basketball, volleyball and football) is relate to diet suggestion before and after competition training. Also, the weakest performance is related to cooling down after competition and weakly training of flexibility and strength in form of team or single training. The correlation between athletes awareness and performance of injury prevention strategies in four sports team is (0/44) ($p \leq 0/01$). The ranking of injury mechanism in four sports shows the injury potential in handball, basketball and volleyball at the time of landing on one foot and in football at the time of tackling. Also, ranking of injury sports on the body shows that the most injury potential in four sports is considered to ankle and knee.

Conclusion: there are major problems in awareness and performance of athletes in respect to prevention of injury. These problems are more specific using protective equipments, cooling down, flexibility and strength training and dietary habits of athlete, before and after physical training. The correlation between awareness and performance in athletes shows that the more awareness of injury prevention strategies, the more performance and reversal. Actually, if athletes awareness of injury prevention strategies.

Increases, a lot of problems in peripheral due to injuries like being away of sports events and injury treatment cost will reduce. Also it is important to concentrate on injury prevention strategies in respect to injury mechanisms in handball, basketball and volleyball in landing after jumping, in football in tackling and in regard body parts respect to injury marks and injury factors in ankle and knee.

Key words: Injury. Awareness. Team sports. Injury mechanism. Prevention strategies.

Sport injuries in young basketball players

Oblakovic-Babic Jelena, Stefanovic Milica, Radivojevic Nenad, Dikic Nenad

Vita Maxima Clinic, Sport Medicine Association of Serbia, Belgrade, Serbia

Introduction: There is not enough studies about teenage male basketball population. Difficulty is to compare existing informations because of non consistent sports injuries statistics. Aim of this study was to identify the basic epidemiology of injuries during training and competition, in young basketball players. Specific objectives are to: 1) quantify basic measures of incidence: incidence rate and the epidemiological incidence proportion; 2) describe injury characteristics (types,

body site, time loss, team position); 3) compare injuries during training and competition; 4) identify injury prevention initiatives.

Material and methods: All injuries have monitored in four selections of one basketball team in Serbia during nine months period. The participants were 61 boys aged from 13 to 19. The 95% confidence intervals were calculated for rate and rate ratio using standard formulas. Differences between training and competition injuries are analyzed by rate ratios.

Results: A total of 50 acute and 18 overuse injuries have been reported. Incidence rate of acute and overuse injuries have been 1.26/1000h exposure and 0.45/1000h exposure, respectively. The overall incidence rate was 1.72/1000h exposure [95% CI: 1.31-2.13]. The epidemiological incidence proportion of injury was 61% [95% CI: 49%-73%], and re-injury was 41% [95% CI: 25%-57%]. The lower extremities injuries were 69.1% of all. Ankle injury have been the most common overall (19.1%) then with the same percentage were knee (13.2%) and foot (13.2%) injuries.

Conclusion: We found that injury rate incidence in young basketball players is not high, although there is not enough available information in the literature to compare with. The most common injured region is ankle. Regarding that prevention strategies could be joint specific stabilizations and proprioception training.

Key words: Sports injury. Children. Basketball.

Does the proper adjustment of a mountain bike prevent of overuse injuries

Sabeti Manuel, Serek Markus, Geisler Matthias, Schmidt Max, Pachtern Tom, Ochsner Antonia, Goll Alexandra

Vienna Medical School, Department for Orthopaedic Surgery

Objectives: Compared to conventional road-cycling, little is known about overuse injuries in mountainbiking. The adjustment of the mountain bike seems to be crucial avoiding these syndromes. No other study has prospectively put overuse injuries into correlation with the mountain bike's adjustment in a competition setting until now.

Methods: This prospective field study consisted of two phases using preformed questionnaires to interview volunteering athletes in a race. In phase one overused body regions were identified in mountainbikers. In phase two riders were examined before and after the race for overused body regions which were put into correlation with the bike's adjustments. The statistical analysis comprised a multivariate analysis.

Results: 169 competitors were analyzed of which 87 had after the race. Most injuries inflicted the lower back, the buttocks and the knee. There was a significant correlation between inadequate saddle pedal distance and the incidence of knee pain ($p < 0.038$), and paraesthetic sensations in the hand ($p < 0.023$). The inclination of the saddle has also significant impact on the occurrence of pain in the buttocks ($p < 0.014$). Symptoms occurred highly statistically in downhill ($p < 0.0001$) and uphill ($p < 0.0007$) passages.

Conclusion: Overuse injuries are frequently observed in competitive mountain bikers. More than half of the investigated athletes had pain at any body region immediately after the race. The bike's adjustment has a significant impact in the occurrence of overuse injuries.

Key words: Mountain bike. Overuse injuries. Prevention.

SPORTS INJURIES PREVENTION-II LANGUAGE: ENGLISH

Different strategies for sports injury prevention in an America's Cup yachting crew

Hadala M^{1,2}, Barrios C³

¹Medical Department, Team Shosholoza, South Africa; ²Department of Physiology, Valencia University Medical School, Valencia, Spain; ³Traumatology and Orthopaedic Surgery Unit, Department of Surgery, Valencia University Medical School, Valencia, Spain

Introduction: Preparation and training of an America's Cup yacht-race crew need a time period which oscillates between 2 and 4 years. Most of the time is spent in base training, physical preparation and conditioning, boat reparations,

ORAL COMMUNICATIONS

and sailing (approximately 9-13 working hours a day). These long working sessions have important repercussions in the physical condition of sailors. The highest incidence (> 2/3 of injuries) is mainly observed in a specific group of athletes with high physical-work intensity (grinders, bowmen, and mastmen).

Methods: A prospective physiotherapy intervention study during competition periods over three seasons was conducted on an America's Cup Yachting-Race Crew of 30 professional sailors. In the 2 first acts (2004), athletes did not receive any preventive physiotherapy. In the 2 acts celebrated in 2005, preventive intervention (phase I) consisted of stretching exercises prior to the yacht race and preventative taping. During the 4 acts corresponding to the 2006 season, the physiotherapy program was implemented adding articular mobilization before competition, ice-baths after competition, and kinesiotaping (phase II). In the last act and the Luis Vuitton Cup (2007), a recovery program with 'core stability' exercises, post-competition stretching exercises, and 12 hours of compressive clothing were added (phase III).

Results: In the pre-intervention phase (2004), the rate of injured sailors/competition day was 1.66, decreasing to 0.60 in 2007 (phase III). The number of athletes with more than one injury was significantly reduced from 53% (8 of 15) to 6.5% (2 of 12). In the pre-intervention period, mastmen, grinders, and bowmen showed a rate of 2.88 injuries/competition day. After phase III, this group only suffered 0.5 injuries/competition day.

Conclusions: The implementation of a program of preventive physiotherapy decreased the risk of injuries suffered during competition by an America's Cup yacht crew.

Key words: Epidemiology. Incidence. Rehabilitation.

Infrared thermography as an injury prevention method in soccer

Gómez PM, Sillero M, Noya J, Pastrano R

Facultad de Ciencias de la Actividad Física y del Deporte (INEF). Universidad Politécnica de Madrid

Introduction: Infrared thermography is considered as a valid and non-invasive diagnostic method¹ of different pathologies², including some musculo-skeletal problems as the lumbar pain³. Modern equipments make possible very accurate and objective recording of the body surface with a single picture.

Materials and methods: We recorded the body temperature of 23 professional players of the C.D. Toledo S.A.D. (Age= 24,9; SD= ± 3,5) on 24 days of its 2-months precompetitive period.

Two thermographic pictures for each player (frontal and dorsal, of the trunk and lower limbs) were taken with a ThermoCAM TM SC640 (FLIR SYSTEMS, Portland) before starting the training season. Mean temperature of the muscular groups: abdominal (AB), quadriceps ($Q_{R,L}$), adductors ($AB_{R,L}$), anterior leg ($AL_{R,L}$), lumbar (L), hamstrings ($H_{R,L}$) and calves ($C_{R,L}$) and the joints: anterior knees ($AK_{R,L}$), posterior knees ($PK_{R,L}$), ankles ($A_{R,L}$) were calculated from the pictures by the software "ThermoCAM Reporter". Additionally, the level of nuisance of those areas was assessed every day by the player from 1 (no pain) to 10 (injured). Temperatures were compared with the declared level of nuisance considering three groups (1 = No pain; 2 - 3 = Low pain; > 4 = High pain). Areas affected by physiotherapeutic treatments were excluded from the sample. Rough reports and pictures from each player were daily reported to the physiotherapist of the team.

Results: ANOVA results point out a direct relationship between the declared level of nuisance of the area and its temperature both in ankles ($F[A_R] = 9.20$; $p < 0.05$ and $F[A_L] = 3.99$; $p < 0.05$) and knees ($F[PK_R] = 5.34$; $p < 0.05$ and $F[PK_L] = 9.14$; $p < 0.05$). There were also found significant differences for temperatures (≈ 0.5 degrees) between the painful and non-painful limb on the knee ($F[AK] = 14.36$; $p < 0.05$) and hamstring ($F[H] = 3.09$; $p < 0.05$) results. None serious injury has been produced among the players during the 2-months of the study.

Conclusion: We concluded that infrared thermography is a valid, fast and convenient method of preventing soccer injuries. We suggest that this technique could also be applied to monitor and diagnose injuries and to quantify training loads in sports.

References:

- Barnes RB. Determination of body temperature by infrared emission. *J Appl Physiol* 1967;22:1143-6.
- Garagiola U, Gianni E. Use of telethermography in the management of sports injuries. *Sports Medicine* 1990;10(4):267-72.
- Pichot C. Use of thermography in chronic lumbar pain. *Rev Soc Esp Dolor* 2001;8:43-7.

Key words: Thermography. Injury prevention. Soccer.

Investigations of course setting geometry in alpine skiing for injuries prevention

Erdmann WS, Aschenbrenner P

Chair of Biomechanics and Technology. J. Sniadecki University of Physical Education and Sport. Gdansk, Poland

In alpine skiing velocities of running of skiers, especially in downhill and super giant, reach values over 30 m/s. Falling down with such velocity can be a source of important contusion or even a death. The length of a course in downhill can be over 3500 m. It is difficult to remember all details of such a long course with 50 or more direction poles in downhill or gates in other alpine disciplines. The skier runs the distances from 1 to 2 min. If he runs the distance in unsuitable way, i.e. with too high velocities and than he needs to decelerate a movement with intense muscle work, then there is a high risk of accident due to improper endurance. This situation is overlapped by sometimes improper gate setting. Course setting is always performed by experienced setter. Nevertheless sometimes this setting is performed with some errors.

The aim of the overall research was obtaining an information on tactics of running of alpine skiers and the aim of this particular presentation was obtaining data on gate setting of four alpine ski disciplines: downhill (DH), super giant (SG), giant slalom (GS), slalom (SL). Investigations were accomplished during FIS Alpine Ski World Cup 2006/2007 where the best world skiers participated. Research work was performed at the following places: Val Gardena, Alta Badia (ITA), Hinter-stoeder (AUT), Garmich-Partenkirchen (GER), Kranjska Gora (SLO), Kvitfjel (NOR). For collecting of data on gate positioning Differential Global Positioning System was used (Figure 1).

It was revealed that after long distance between gates, where skier can achieve high velocity of running sometimes there is a big angle of deviation of a course (left or right) which is very difficult to follow (Figure 2). If this happens at the end of a course than there is a high risk of running out of a track or an accident can happen. The worst examples where skiers did not finished a run (different reasons) were of GS and SL in Kranjska Gora, where 35% and 31%, respectively, and during running of a GS in Hinterstoeder where 26 % of skiers did not finished running of a course. Another example is when the next gate is situated below downcast (Figure 3). In this case when a skier achieved high velocity due to small angles of deviation within the previous gates and he or she do not see well the position of the next gate then he or she has difficult situation to keep proper track of running. This happened in Kvitfjel (NOR) during running of SG. From 66 skiers 10 of them ran out of a track at the same gate nr 25 which was situated after the downcast. In order to diminish a number of wrong running it is postulated that organizers of a competition will ask sport analysts to present configuration of gates done just after course setting. This information would be available for all participants of a competition, including setter and a referee for checking the correctness of a setting.

Key words: Alpine skiing. Course geometry. Injury prevention.

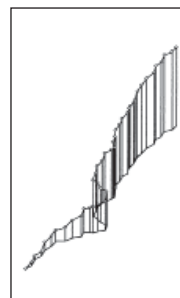


Figure 1 Erdmann WS

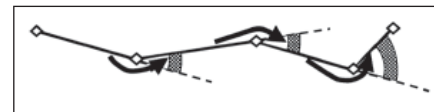


Figure 2. Erdmann WS



Figure 3. Erdmann WS

Isokinetic trunk strength assess in high level ice skaters

De Campos Gutiérrez de Calderón A¹, López Román A², Lafarga Berciano J², López-Illescas Ruiz A¹

¹High Sports Council (Spain); ²"Alfonso X El Sabio" University (Madrid, Spain)

Ice skaters begin their sport activity at a very early age, whilst bearing great musculoskeletal immaturity. This, together with the high linkage of the back in technical gestures such as the landing of the jumps, the dorsal spirals or the Biellmann position, constitutes a main risk factor of vertebral pain. It is essential, therefore, to detect any biomechanical impairments in order to prevent back injuries.

Objectives:

- Identify strength biomechanical instabilities as risk factors likely to cause trunk injuries in ice skaters.
- Analyse trunk muscular balance through isokinetic flexion – extension movements.
- Find out which parameters are most suitable and discriminative to assess isokinetic trunk strength.
- State reference values regarding such parameters within elite ice skaters.

Materials and methods:

Subjects: 45 healthy high level ice skaters, 20 men and 25 women (age range, 12 – 17 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, Angle distribution of peak torques along the Range of Movement (ROM) and Maximum Work Repetition.

Results:

- The agonistic / antagonistic ratio is the most stable parameter within ice skaters.
- The data obtained through testing in Semi Standing (Functional) position showed the higher values of Maximum Peak Torque.
- Great data instability, though not significative, was found in the values of the Angle of Peak Torque.

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 ice skaters.
- The functional test is the most suitable to assess the Flexion / Extension strength ratio.
- The first normative values within different variables were established.
- Further investigation is needed to assess properly the morphology of the curve.

In this trial, the results belong to data obtained along the development of the project: "ViP: 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.

Key words: Ice skating. Isokinetics. Strength. Back. Biomechanics. Medicine.

Long-term monitoring muscular enzymes in football players

Mercuri R, Stefani L, Innocenti G, Moretti A, Manetti P, Galanti G
Sport Medicine center of University of Florence- Florence

Introduction: The skeletal muscle enzymes level is a marker of the functional status of muscle tissue, and varies widely in both pathological and physiological conditions. An increase in these enzymes may be an index of cellular and tissue damage as a consequence of acute or chronic muscle injuries. However changes in serum levels of muscular enzymes are also found in normal subjects and athletes after strenuous exercise and the amount of enzymes release from muscle tissue into blood can be influenced by physical exercise. The aim of study is to evaluate and follow up in football players the muscular enzyme plasma levels 24 h after every official match for almost two months.

Methods: Since September 2007 to November 2008 among the 18 professional footballers (7 defenders, 7 midfielders and 4 forwards) of Serie A team ACF Fiorentina a consecutive blood sample was obtained. Plasma creatine kinase (CK), myoglobin (Mb) and lactated dehydrogenase (LDH) activity were determined exclusively in subjects playing a match, 24 h after a official match.

Results: The values are expressed as mean as standard deviation. The day after the match, the plasma levels of CK, Mg and LDH was significantly higher than at rest (CK 748 U/L, Mg 91 ng/mL and LDH 224 U/L). In addition CK shows values within the range from 156 to a maximum 1953 U/L. Mg a range from 36 to 318 ng/mL and LDH from 166 to 255 U/L. A significant correlation is present between CPK and Mg values ($r=0.86$).

Conclusions: The data shows that a series soccer- matches determines an increase in the muscular enzyme plasma levels. The behaviour of them after a strenuous exercise is peculiar for each athlete that has personal values of references. There are numerous factors and variability in a match that can modify the enzyme level: among these the number of contrast and injuries, the emotive and physical intensity of the competition and the ambient temperature. For further clinical implication several studies will be necessary in future.

Key words: Muscular enzymes. Football players. Exercise.

SPORTS MEDICINE-I

LANGUAGE: SPANISH

Repeated traumatism effect on the forearm bone mass in karate men

Luque AJ, Martínez AB, López FJ, Martínez A, Villegas JA

Department of Exercise Physiology. San Antonio Catholic University (UCAM). Murcia. Spain

Background: Bones are an extraordinarily ductile tissue, capable of responding to the stimuli that are exerted on it, such as traction strengths, flexion, rotation and other excitations of mechanic character.

Result of this, an unceasing activity of formation and destruction of bone tissue take place, which we would be able to understand as an structural and biomechanic adaptation to these stimuli.

Beside, bone is an organ of high metabolic complexity, in which growth, modelling and remodelling influence a high number of chemical mediators.

Our aim is to study the effect of fitness as karate on the skeletal system and its repercussion on bone parameters like mineral content and mineral density.

Forearm bones are receptors of repeated traumatism during karate training and competition. For this reason, the forearm bone study is essential to determine the local importance of mechanical stimuli in bone mass.

Finally, certain biomarkers of bone activity could be correlated with the findings obtained be means of radiological densitometry techniques.

Methods: The analyzed data corresponds to 14 karate men, between 20 and 30 years old, who belongs to different categories that complete the three determinations that include the longitudinal cross study carried out during 11 months.

Bioimpedanciometry, Classic Anthropometry, Pletismographic Densitometry, Radiological Densitometry (DEXA) and blood and urinary analysis were carried out during these determinations.

The statistical analysis of variables was done by means of ANOVA for repeated measurements with an intra-subject factor (time) and, also, by means of the lineal correlation of Pearson between every radiological and biochemical variables that showed significant changes or tendency to the significant modification in ANOVA test.

Results: Significant changes were not observed in the total bone mass of karate men that was measured by means of Bioimpedanciometry and Classic Anthropometry ($p<0,567$ y $p<0,06$, respectively).

Significant changes or closed to the statistical significance were observed on: phosphatemia ($p<0,003$) –increase–; calcaemia ($p<0,073$), magnesemia ($p<0,000$), triyodotironine ($p<0,005$), y parathormone ($p<0,000$)–decrease–.

There was a tendency to the increase in all the bone mineral contents and an increase statistically significant in every bone mineral densities ($p<0,052$, $p<0,036$, $p<0,032$ respectively).

A strongly positive correlation between all the radiological variables throughout the study (r values from $r=0,543$ to $r=0,992$).

The best evolutive correlations with regard to the radiological variables were found on calcaemia, phosphatemia, intact parathormone and calcium in urine of 24 h.

Conclusions:

- The suffered traumatism for karate men in forearm bones are an effective stimulus to promote a density and mineral content local increase.

ORAL COMMUNICATIONS

- The suffered traumatismos for karate men in forearm bones and the kind of fitness carried out in karate do not lead a significant increase of the total bone mass.
- Calcaemia, phosphatemia, magnesemia and calciuria of 24 h. could be interpreted as chemical "indications" for the study of the bone tissue activity.
- The intact parathormone is the more sensitive hormonal variable to explain the observed changes in the biochemical and radiological variables link to the osteogenesis.
- The bone alkaline phosphatase is a right marker of osteogenesis excluding hepatic and/or renal pathology and using a method for its determination that would be able to avoid the cross reactivity between different isoenzymes.

Key words: Traumatismos. Bone mass.

Physical activity as a potential health risk factor

Greco J¹, Gris G², Valerio M³

¹Head. ²Full Professor. ³Coordinator. Universidad Maimónides. Licenciature in Physical Education and Sports. Buenos Aires, Argentina.

Introduction: An inappropriate diet is considered a health risk factor and yet nobody doubts the benefits of eating. Something similar can be said of physical activity.

The aim of this work is to verify whether the goals some people set for themselves regarding their health and/or quality of life agrees with the characteristics of their physical activity.

There is ample scientific evidence regarding the benefits that exercise has on health as long as it complies with certain requirements.

Materials and methods: The Licenciature in Physical Education and Sports at Universidad Maimónides designed a questionnaire that was answered by 513 subjects in June 2008. The subjects all attended gymnasiums in the City of Buenos Aires and nearby locations (Argentina).

Healthy activity was understood to be that which included health tests and screenings, consisted of a written plan with both aerobic and muscle strength exercises, could be adjusted to different physical conditions and was undertaken at least 3 times a week in sessions lasting over 30 minutes each time.

Results: Health or quality of life were the reasons given by 318 subjects (62.0%) for attending a gym. More information regarding this group made up of 174 females (54.7%) and 144 males (45.3%) is shown in the Table 1.

The Figure 1 shows that achieving a health-related goal does not coincide with the facts.

The Figure 2 below shows that only 6 subjects (1.9%) in our study complied with the minimum requirements needed for physical activity to be performed as a health-oriented tool.

Conclusion: The way physical activity is delivered by gymnasiums, according to this sample, is unlikely to produce the true health benefits users expect to achieve when they join.

Thus, inappropriate physical activity entails a potential risk factor.

Key words: Physical activity. Health. Gymnasium.

Table 1. Greco J, et al.

Number	Average age	Average weight	Average height
(n)	(yrs)	(kg)	(cm)
318	43.0±14.9	69.2±14.0	168.3±9.6

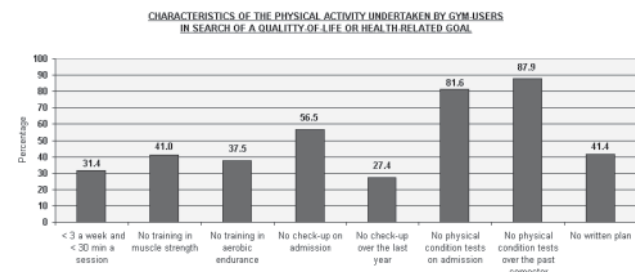


Figure 1. Greco J, et al. Shows that achieving a health-related goal does not coincide with the facts

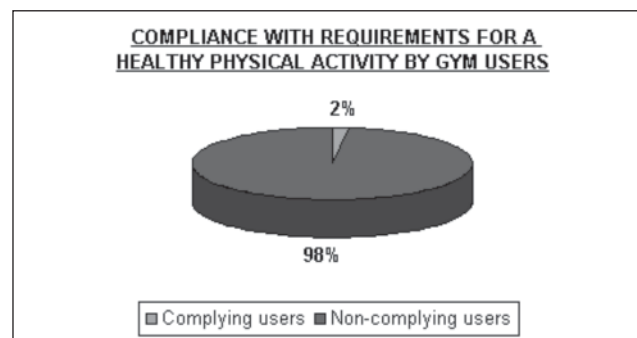


Figure 2. Greco J, et al. Below shows that only 6 subjects (1.9%) in our study complied with the minimum requirements needed for physical activity to be performed as a health-oriented tool

Doping as addiction: a new approach?

D'angelo C, Tamburrini C

Secretary for the Prevention of Drug Abuse and Fight of Drug Trafficking within the Argentinean Government. Stockholm Bioethics Centre, Stockholm University, Sweden

Traditionally the doping debate has been dominated by those who want to see it forbidden (hereafter *the prohibitionist view*) and those who want to see it permitted (*the ban abolitionist view*). The reasons usually advanced for proscribing doping consist for instance in arguing that doping is dangerous for sports practitioners' health, that it renders an unfair competitive advantage or that it runs counter "the spirit of sports". Among the reasons raised for lifting the ban we find that the prohibition is paternalistic, that the doping list is arbitrarily designed, or that the control measures are too expensive, among others.

In this presentation we analyse a third position stating that doping use is a symptom of the paradigm of high competitive elite sports, in the same way as addictions reflect from current social paradigms in wider society. For that reason, doping in elite sports has to be considered as an addiction and should be handled with accordingly.

We concentrate our discussion on the fact that professional sportspersons most often are tested positive for marihuana, cocaine and anabolic steroids. Starting from a conceptual distinction between occasional use, habitual use and addiction, we focus on the physical and/or mental dependency caused by the addictive use of a certain drug and argue that marihuana, cocaine and anabolic steroids abuse satisfies at least one, often both, of these conditions.

A conclusion to be drawn from our arguments is that the prohibitionist view is inappropriate to deal with doping, as the severe sanctions attached to it will cut the doper off her/his professional environment, thereby risking to reinforce her/his addictive conduct. But the ban abolitionist view seems inappropriate as well. Usually we do not consider reasonable not to intervene in front of compulsory conduct that the agent has reduced or even no control over.

Instead our proposal will be to contextualise dopers' conduct within sport health care and see it strictly in relation to each athlete's personal background. Through the development of preventive programmes - implemented through personalized counselling and eventually treatment, rather than severe sanctions or the mere lifting of the ban - seem to be a more reasonable, and probably more efficient, way of conducting "the war against doping".

Key words: Doping. Addiction. Sport.

Novel desmocollin-2 gene mutation associated with arrhythmogenic right ventricular cardiomyopathy in a professional athlete

Ortiz M¹, Syrris P², Hermida-Prieto M³, Barriales-Villa R⁴, Fernandez X³, Evans A², Rodríguez-García M³, Cazón L³, Castro-Beiras A⁴, McKenna W⁵, Monserrat L⁴

¹Fundación Carolina. Spain; ²Department of Medicine. University College London; ³Instituto de Ciencias de la Salud. Universidad de La Coruña. Spain; ⁴Complejo Hospitalario Universitario A

Coruña. INIBIC. Spain; ⁵The Heart Hospital. University College London

Introduction: Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a frequent cause of sudden death in athletes. The disease is usually caused by mutations in desmosomal genes. Competitive sport may be associated with a more severe disease expression in mutation carriers.

Material and methods: Clinical, familial and genetic study of an athlete with ARVC, including direct sequencing of five desmosomal genes (desmoplakin, desmocollin-2, desmoglein-2, plakophilin-2 and plakoglobin).

Results: The proband was a 44 year old ex-professional pole vault jumper who had suffered a cardiac arrest while jogging. A sustained ventricular tachycardia with left bundle branch block morphology was documented. Baseline electrocardiogram showed negative T-waves in right precordial leads. The echocardiogram showed left ventricle dilation (56 mm) and systolic dysfunction (ejection fraction 45%), and mild global right ventricle dilation with hypo- and akinetic areas in the outflow tract. Fibrofatty infiltration was present in RV inflow and outflow tract areas in magnetic resonance images. A cardiac defibrillator was implanted and a single appropriate intervention was recorded five years later. At family screening, his asymptomatic 70 year old father showed left ventricular dilation (60 mm) with systolic dysfunction (ejection fraction 50%), and mild right ventricular dilation with doubtful areas of hypertrabeculation and hypokinesia. His electrocardiogram showed low voltages and first-degree atrioventricular block, without additional diagnostic features of ARVC. A novel splice site mutation in intron 11 of desmocollin-2 gene (IVS11+2T>C) was detected in both cases. This change was absent in 100 caucasian healthy controls and is predicted to lead to truncation of the desmocollin-2 protein in exon 11. Only 5 ARVC related mutations have been previously described in this gene.

Conclusions: We have identified a novel ARVC related mutation in desmocollin-2 gene (IVS11+2T>C). Competitive sport practice could have contributed to an earlier and more severe disease expression in the index case of the described family.

Key words: Cardiomyopathy. Genetics. Sudden death.

Strength training reduces circulating leptin levels independent of changes in fat mass in women, but not in men

Guadalupe-Grau A, Perez-Gomez J, Olmedillas H, Delgado-Guerra S, Chavarren J, Dorado C, Calbet JAL

Department of Physical Education, University of Las Palmas de Gran Canaria, Spain

Leptin is an adipocytokine that plays a role in the regulation of appetite, metabolic rate and fat deposition. This hormone is primarily secreted by white adipose tissue in proportion to the size of the fat stores and acts on brain and peripheral receptors present in tissues that play a role in generating and withstanding of forces like muscles¹ and bones². Strength training is associated with increased energy demand and changes in body composition³, which in turn could influence serum leptin concentration. However, it remains unknown whether high intensity training, like strength training combined with plyometric jumps could modulate the relationship between fat mass and leptin. Our hypothesis is that strength training may reduce circulating levels of leptin independently of the changes that strength training could elicit in fat mass. Therefore, the purpose of this study was to determine if strength training reduces circulating leptin levels in the same way in men and women, and if this effects is exclusively dependent on the changes in fat mass.

Methods: The study began with forty-three male physical education students (age 23.9 ± 2.4 years, height 176.7 ± 7.1 cm, body mass 73.2 ± 10.1 kg; mean ± SD) and twenty-three female physical education students (age 23.2 ± 2.7 years, height 164.6 ± 6.3 cm, body mass 59.9 ± 5.8 kg mean ± SD). Subjects were randomly assigned to two groups: one group performed strength training (ST) combined with plyometric jumps (TG) during 9 weeks, and the other group served as a control group (CG). Maximum dynamic strength (1RM) for all exercises consisting in leg extension (LE), half squat (HS), inclined leg press (ILP) and leg curl (LC), was assessed immediately before and at the end of the strength-training period, body composition was determined by DXA and leptin serum concentration was measured with a ELISA kit.

Results: Both genders experienced a similar relative strength improvements in all exercises (p<0.01). Body fat mass was unchanged in all groups after the study intervention, whereas whole body lean body mass increased significantly by 1.6 and 1.4% in the male and female TG, respectively (ANOVA time effect:

p<0.001). No group by time, nor sex by group by time effects were observed. Lower extremities lean mass was similarly increased by 4.5 and 5.3% in TG men and women (P<0.05). Plasma leptin concentration was reduced with training (group by time interaction: p<0.05), but only in women (gender by time interaction in the training group: p=0.009). This difference remained significant after accounting for the percentage of body fat as a co-variable (p<0.05).

Conclusions: This study shows that, in young women, serum leptin concentration is reduced after 9 weeks of strength training combined with plyometric exercises. This effect was not explainable by changes in fat mass, since fat mass was not modified by strength training. This finding is compatible with enhanced leptin sensitivity in women after strength training. Men and women showed similar relative improvements in maximal dynamic force (1RM). These effects were in part explained by a similar degree (4-5%) of muscle hypertrophy in the lower extremities, which was also similar in men and women.

Supported by grants from Ministerio de Educación y Ciencia, Spain (BFU2006-13784/BFI and DEP2006-56076-C06-04/ACTI), Gobierno de Canarias, Spain (PI042005/177) and Universidad de Las Palmas de Gran Canaria, Spain (UNI2006/05).

Key words: Leptin. Strength training.

Anthropometric variables and somatotype of patients who begin a cardiac rehabilitation program

Martín A¹, Cabañas D², Abello V³, Gómez-Barrado J³, Fuentes JP⁴, Díaz C⁴, Barca J⁴

¹Centro de Medicina Deportiva de Cáceres. Grupo de Rehabilitación Cardiovascular; ²Universidad Complutense de Madrid. Grupo de Rehabilitación Cardiovascular; ³Hospital San Pedro de Alcántara de Cáceres. Grupo de Rehabilitación Cardiovascular; ⁴Universidad de Extremadura. Grupo de Rehabilitación Cardiovascular

Background: Cardiac Rehabilitation (CR), should be a normal procedure in hospital protocols. The benefits of physical exercise on body composition and in preventing cardiovascular seem clear, however the number of patients in Spain are included in CR programs is reduced and references anthropometric slim. The aim of this study was the morphological characteristics and body composition variables obtain related cardiovascular risk in patients who have suffered a heart attack and fell into a programme of CR with tennis in phase II.

Methods: 20 men infarction patients, an average age of 52.8 ± 6.2 years, completed the anthropometric study in Phase I hospital. Weight, height, waist circumference (WC), hip circumference, and skin folds were measured. We calculated the Body Mass Index (BMI), Waist Hip Ratio (WHR), the sum of 8 folds (Σ 8) and somatotype, estimating the body fat (BF) %.

Results: After analysis, reflected the following details: Weight (82.6 ± 10.7 kg), height (168 ± 7 cm), BMI (29 ± 2.9 kg/m²; ≥ 30 in 35%), WC (99.2 ± 7.5; > 102 cm. in 30% and > 94 cm. in 80%), WHR (0.99 ± 0.05; > 0.95 in 90%), Σ 8 (143.4 ± 23.7 mm; > 122.3 in 80%), BF% (28.6 ± 3.6; > 25 in 85%), endomorphy (5.1 ± 1.08), mesomorphy (6.0 ± 1.10) and ectomorphy (0.5 ± 0.51).

Conclusion: Patients who have suffered myocardial infarction presented anthropometric variables increased risk of cardiovascular, WC > 94 cm, WHR > 0.95, Σ 8 > 122.3 mm and BF% > 25, risk variables are detected in the 80-90% of subjects. The somatotype is mesomorphic endomorphic represent a high robustness musculoskeletal, moderately-high adiposity and very low linearity. Preventive measures should be aimed at changing the variables of body composition of increased risk and somatotype.

Key words: Cardiac rehabilitation. Anthropometry. Tennis.

SPORTS MEDICINE-II LANGUAGE: SPANISH

Criterion-related validity of the sit-and-reach tests as measures of hamstring muscle extensibility in athletes

López-Miñarro PA¹, Alacid F¹, Muyor JM²

¹Universidad de Murcia; ²Universidad de Almería

Introduction: Evaluation of the hamstring muscle extensibility is a standard assessment because reduced muscle extensibility has been related to changes

in lumbopelvic rhythm and low-back disorders. The sit-and-reach (SR) and toe-touch (TT) are field tests commonly used to measure the hamstring muscle extensibility because their procedures are simple, easy to administer, require minimal skills training and are useful tests in large-scale extensibility evaluation in the field setting. The aim of this study was to analyze the criterion-related validity of the sit-and-reach and toe-touch tests as measures of hamstring muscle extensibility in athletes.

Material and methods: Fifty-five athletes (mean age: 14.65 ± 0.67 years) with more than five years of training participated in the study. Two trials of straight leg raise (SLR) (left and right), SR and TT tests were done in a random order. The SR and TT scores were recorded with a SR box (ACUFLEX I Flexibility tester) once the subjects had reached forward as far as possible without flexing the knees. A reach distance of 0 cm corresponded to the position of the feet against the box. Pearson correlation coefficients were used to define the relationships between SR and TT scores with respect to SLR. T tests for dependent correlations were used to test the statistical differences between the criterion-related validity of the SR and the TT tests.

Results: Mean values of SR and TT were 5.39 ± 7.89 cm and 2.79 ± 7.54 cm, respectively. The mean values of SLR right and left were $82.86^\circ \pm 12.99^\circ$ and $83.77^\circ \pm 13.50^\circ$, respectively. The correlation values between SLR and SR were moderate (left leg: $r = 0.72$, $p < 0.001$; right leg: $r = 0.77$, $p < 0.001$). With regards to the TT the values were also moderate (left leg: $r = 0.71$, $p < 0.001$; right leg: $r = 0.74$, $p < 0.001$). The T-tests for differences in dependent correlation indicated that, for the criterion-related validity of hamstring extensibility, no differences were found between the SR and TT correlation values.

Conclusions: The validity of sit-and-reach and toe-touch tests for measuring hamstring muscle extensibility is moderate. To evaluate the hamstring extensibility in athletes other tests with more criterion-related validity should be applied.

Key words: Measurement. Flexibility.

Sagittal lumbar spinal curvature during the lat pulldown exercise

López-Miñarro PA¹, Rodríguez-García PL¹, Alacid F¹, Muyor JM²

¹Universidad de Murcia; ²Universidad de Almería

Introduction: The spinal posture is an important modulate factor on intervertebral disc loads. Sagittal spine curvature is an important parameter for postural load balance in healthy males. The objective of this study was to evaluate the posture of lumbar spine during lat pulldown exercise.

Material and methods: A total of 66 male recreational weight lifters (average age: 24.7 ± 4.9 years) without upper limb or spine injuries participated in this study. Lumbar curvature was measured with a Unilevel inclinometer (ISOMED) while the subjects standing in their usual relaxed posture before to start weight training. After a warm-up and static stretch routine, the lumbar curvature was again measured during the end of concentric phase in the sixth repetition and at the end of eccentric phase in the eighth repetition of lat pulldown exercise executes on a standard lat pulldown machine. The weight was chosen by the subjects based on their perceived ability to perform between 10 and 12 repetitions until failure. Two trials were performed and the average were entered for data analyses.

Results: Mean lumbar values during lat pulldown exercise were $23.35^\circ \pm 16.22^\circ$ at the end of concentric phase and $20.79^\circ \pm 14.82^\circ$ at the end of eccentric phase ($p < 0.05$). Lumbar lordosis in relaxed standing was $31.62^\circ \pm 7.41^\circ$ ($p < 0.001$ with respect to exercise in both concentric and eccentric phases). A greater frequency of lumbar hypolordotic postures was found. However, the frequency of lumbar hyperlordotic postures was low.

Conclusions: The lat pulldown exercise showed a significant reduction of lumbar curvature with respect to the relaxed standing posture, because the sitting position adopted to execute the lat pulldown exercise reduces the lumbar lordosis. We recommend to use an anterior tilt seat to prevent lumbar hypolordotic postures.

Key words: Posture. Spine. Weight-training.

Anthropometric characteristics, body composition profile and physical fitness of an America's Cup yacht crew

Hadala M^{1,2}, Barrios C³

¹Medical Department, Team Shosholoz, South Africa; ²Department of Physiology, Valencia University Medical School, Valencia, Spain; ³Traumatology and Orthopaedic Surgery Unit,

Department of Surgery, Valencia University Medical School, Valencia, Spain

Introduction: To date, there are few physiological data on elite America's Cup sailors describing their anthropometrical and physical profiles. In addition, body composition and anthropometric characteristics of sailors depending on their specific physical work related with boat position has never consistently reported.

Differences between morphological and physical condition variables of sailors according to their boat position were also investigated. Finally, correlations of the anthropometric parameters with physical condition variables were also addressed.

Methods: Anthropometric and physical fitness measurements were performed to all components of an America's Cup yachting crew at the beginning of each sailing season from February 2004 to January 2007 (32nd America's Cup). The recorded anthropometric measures were: body weight, height, body mass index (BMI), skinfold thickness, and girths. Physical fitness was evaluated by hamstrings muscles flexibility, strength and the Wingate power tests. For physical conditioning purposes, positions on the boat were divided into three categories: high, mild and low physical-work intensity.

Results: Except for muscles mass, there were no significant differences in any of the anthropometric variables during the 4-years period of study. Mean BMI (>27) was within the range of overweighted people. Sailors requiring high physical work intensity represented the youngest group of athletes, the tallest, and the heavy weighted. This group had statistically significant higher values for BMI, limb body mass, 1RM bench press and Wingate tests. Positive correlations were found between 1RM bench press and BMI, muscle, and body fat mass (kg). Peak Watts results correlated also positively with BMI, muscle and body fat mass, 1RM bench press, 1RM/weight, and grip strength.

Conclusions: Body composition profile, anthropometric data and physical conditioning tests of athletes involved in America's Cup yachting differs in relation to the different physical requirements. Anthropometric parameters correlate with physical tests parameters.

Key words: Anthropometry. Body composition. Physical fitness.

Effect of school physical education program on low-back pain in schoolchildren

Rodríguez-García PL¹, López-Miñarro PA¹, Santonja F¹, Muyor JM²

¹Universidad de Murcia; ²Universidad de Almería

Introduction: Recent surveys report a high prevalence of low back pain in children and adolescents that increases with age. Decreased muscle flexibility and trunk strength have been postulated as risk factors for low back pain. The objective of this study was to evaluate the efficacy of a 32-week school physical education program on low-back pain in elementary and secondary schoolchildren.

Material and methods: Forty-one elementary school children (fifth-grade, mean age of 10.27 ± 0.31 years) and 43 secondary school adolescents (two-grade, mean age of 13.46 ± 0.68 years) were assigned to control ($n = 40$) or intervention group ($n = 44$). All schools were public schools with similar curricula. Intervention subjects were involved in organised physical education program administered by school teachers that included 5 minutes of hamstrings stretching maintaining the spine in a neutral position, 5 minutes of endurance strength of the abdominal (curl-ups and isometric side support), and lumbar (lumbar extension and bridge) muscles, and 5 minutes of learning activities for anterior and posterior pelvic tilt during the two-weekly school physical education classes over 32 weeks. The control group was not subjected to the organized program. Disability from low back pain was assessed before and after the program. Low back pain was defined as pain in the area from below the ribs to the hips. The subjects and their parents were asked with a questionnaire prior and after the program if they had any low back pain at the past month. Month frequency was defined as the occurrence of pain or discomfort, continuous or recurrent, at some point in the past month. Pain intensity was recorded using a Visual Analogue Scale. The Mann-Whitney U test was used to compare the intensity of low back pain between groups. The frequencies of low back pain between groups were compared using the chi-squared test.

Results: We detected a decrease of frequency in the intervention group and an increase in the control group. In the pre-test, eight schoolchildren (9.5%) of the intervention group and ten schoolchildren (11.9%) of the control group referred low back pain. In the post-test (32 weeks after), only two schoolchildren in the intervention group (2.4%) had low back pain at the past month although this reduction was not significant. In the control group nineteen schoolchildren (22.6%)

suffered low back pain at the past month ($\chi^2 = 4.43$, $p < 0.05$). For pain intensity no significant differences was found.

Conclusion: The children and adolescents who were subjected to the program showed a reduction of low back pain frequency after following the school physical education program, while for the controls group we detected a tendency toward rising frequency of low back pain. These findings should alert education professionals to the need for specific health promotion programs in schools for prevent low back pain. This observation may have important practical implications in designing school curricula, with more attention on spine health.

Key words: Low-back pain. Physical education. Physical exercises.

Back school program effects through the Roland-Morris disability questionnaire

Muyor Rodríguez José María¹, López-Miñarro Pedro Ángel², Ramírez Patricia³

¹Universidad de Almería; ²Universidad de Murcia; ³Instituto Corpore Sano S.L.

Introduction: Nonspecific chronic low back pain (LBP) is a common complaint in many countries, with more than 70% lifetime prevalence. To date, many therapeutic interventions have been performed and studied for the treatment of LBP. The objective of this study was to evaluate the effects of a back school program on low back health.

Material and methods: A total of 54 subjects with LBP (17 men and 37 women; average age, 42.3 ± 8.7 years) participated in this study. All subjects were enrolled in a back school program (BSP). The Roland-Morris Disability Questionnaire (RDQ), a 24-item back pain-specific disability scale was administered at the baseline (pre-BSP), and 20 week after (post-BSP). The scale score ranged from 0 (no disability) to 24 (severe disability). Back School consisted of 40 lessons over a 20-week period. There were two sessions per week and each session lasted 30 minutes. The program was based in strength and stretching exercises, motor control, auto-resistive exercises and mobility activities. The Wilcoxon Signed Rank test was used to calculate changes within the group before and after the intervention.

Results: A total of 152 items were marked in the pre-BSP, while 102 items were marked in the post-BSP (less disability). Significant differences ($p < 0.05$) were only revealed in three variables: "Because of my back, I use a handrail to get upstairs"; "Because of my back, I lie down to rest more often" and "I only stand for short periods of time because of my back". However, we found more disability in four variables ($p > 0.05$): "Because of my back, I am not doing any of the jobs that I usually do around the house", "I get dressed more slowly than usual because of my back", "My appetite is not very good because of my back pain" and "I have trouble putting on my socks (or stockings) because of the pain in my back".

Conclusion: The back school program was an effective program to reduce low back troubles, because it showed improvements in physical disability (caused by low back pain) in the most of the Roland-Morris Disability Questionnaire items.

Key words: Roland-Morris Disability Questionnaire. Back pain. Back school program.

SPORTS MEDICINE-I

LANGUAGE: ENGLISH

Immune response and long-term adaptation to significant physical loadings in top sportsmen

Dorofieieva Elena E

Donetsk State Olympic Training sports college, Ukraine

Introduction: Long-term adaptation to significant physical loadings is a basis of sports trainings. Physical loading during trainings and competitions influenced on immune response functional activity of immune cells. Significant physical loadings in sportsmen can result in formation secondary immunodeficient conditions.

Methods: In 55 top sportsmen (swimmer and cyclist) in the age of from 15 till 22 years studied features of immunity at long-term adaptation to significant physical loadings and revealed the shifts developing an effort of

adaptable mechanisms. At the same period of time 20 healthy subjects (15-22 years) not engaged in physical training or sports activities were utilized as the additional control group. Dynamics of sports results, a level of the sports skill were studied and ECG, EhoCG, adenosine-three-phosphate (ATP) level in erythrocytes were analyzed in sportsmen. 15 sportsmen (27,3 %) was worsened results, 16 (29,1 %) - showed stable results and 24 (43,6 %) - improved results. Worsened of sports results within one year were one of the criteria, indicating on effort of adaptable mechanisms. The condition of the immune status were studied on level Ig A, M, G, E, T- and B- lymphocytes (CD - 4+, CD - 8+, CD - 16+).

Results: The separate criteria indicating on adaptation met with different frequency in sportsmen. Deterioration of sports results is marked in 27,3%, the electrocardiogram attributes of effort of adaptation are revealed at 9,1%, the high-grade hypertrophy of a myocardium left ventricle (HMLV) - at 20,0%, and decrease erythrocytes ATP level is lower than 0,630 mkmol/ml - at 43,6 %. It can be connected to various mechanisms of development of these shifts. Top sportsmen do not have activation humoral a link of immunity (normal level IgM, IgG, reduced IgA and a normal level of circulate immune complex), but have increased IgE level. Parameters of a cellular link of immunity were characterized by decrease CD-8+, normal level CD-4+ and level CD-16+ in sportsmen. CD-8+ was $22,4 \pm 2,1$ % at persons of control group, $17,6 \pm 1,6$ % - at sportsmen ($p < 0,05$). Presence of signs of effort of adaptable mechanisms in sportsmen was combined with more expressed shifts in an immunity condition.

The lowest level IgA is revealed at sportsmen with ECG- signs of effort of adaptation, with level ATP lower than 0,63 mkmol/ml and high-grade HMLV. Sportsmen with HMLV, especially with high-grade HMLV and sportsmen with low level ATP had lowest level IgM. The most significant decrease CD-8+ was at sportsmen with high-grade HMLV and low level ATP. Decrease of B- lymphocytes was more significant at persons with EKG- signs of effort of adaptation and low level ATP. Hence, depression humoral a link of immunity (decrease IgA, IgM and level B- lymphocytes) was more significant in sportsmen with signs of effort of adaptable mechanisms.

Conclusion: Thus, influence of significant, long physical loadings on the immune status in many respects depends on a level of adaptable opportunities of sportsmen and the immune status is more considerably changed at sportsmen with an effort of adaptable mechanisms. It is shown in established decrease of IgA and IgM levels, B-lymphocytes number, imbalance T-helpers and T-suppressors.

Key words: Immunity. Hypertrophy. Sportsmen.

Factors influence on sports result and traumas in top wrestler

Dorofieieva Elena E¹, Lieberman Mark²

¹Donetsk State Olympic Training sports college, Ukraine. ²International Association of Traditional Wrestling Sports, Israel.

Introduction: Athletes expose environment and considerable physical activity. Physical activity must be optimal because only these loads guarantee efficacious functioning of athlete's organism. But excessive physical and psychological loads are one from reason of sport trauma.

Methods: 65 trained athletes (30 athletes of Greco-Roman wrestling (I group) and 35 athletes of Belt wrestling (II group)) (age 15-19 years) volunteered to participate in the study. At the same period of time 20 subjects (16-22 years) not engaged in physical training or sports activities were utilized as the additional control group. At 65 wrestlers study factors, that influence on sport result, typological orientation of central nervous system, quantity of sport's traumas and adaptation's shift by ECG, EhoCG, level general calcium, Ca^{2+} , magnesium, iron of blood plasma.

Results: Stigmas of dysplasia connective tissues (DCT) was at (60,0%) wrestlers, nidus of persistent infection at 26,1%. An abnormality of adaptation's mechanism at top wrestler with DCT, especially in the presence of mitral valve prolapse, was more frequent than at athletes without DCT. Level of sodium and potassium was normal, but level general calcium and Ca^{2+} was decrease on 5,2% and on 18,5%. Level of iron in blood serum was low than control group ($15,5 \pm 2,5$ mmol/l $p < 0,1$). Evidence of shift depends on presence of DCT. Quantity of sport's traumas was higher in I group than II group. It presents with rules belt wrestling (start of struggle with mutual clinch). This reduces risk traumas of shoulder, head and neck.

Conclusion: Innate and acquired factors influence on the sport's results. Peculiarity of connective tissues and peculiarity typological orientation of central nervous system occupy important place in the middle of innate factors, Morbidity,

ORAL COMMUNICATIONS

nidus of persistent infection and defect of nutrition occupy important place in the middle of acquired factors. Belt wrestling is less traumatic kind of wrestling and one may recommended for young people.

Key words: Factors. Wrestler. Sport result. Trauma.

Stress fractures in elite Greek track and field athletes. Epidemiologic characteristics

Malliaropoulos N, Papalexandris S, Papalada A

Sports Medicine Clinic of the Greek Track and Field Federation (SEGAS), Thessaloniki, Greece

Introduction: Scarce data exist in medical literature about stress fractures in purely track and field athletic populations. The aim of the study was to investigate the epidemiology of stress fractures in elite Greek track and field athletes.

Methods: Retrospective review of the medical records of the athletes who were seen at our sports medicine clinic and diagnosed with a stress fracture from 1990 until 2007.

Results: Ninety one cases with 96 stress fractures were retrieved from the medical records. Forty three were male and 48 female, with an average age of 19.8 years (range 14-28). The stress fracture incidence for the study period was calculated at 0.07 fractures per 1000 athlete-hours. The average time from the onset of symptoms until the athletes sought for medical advice was 5 weeks (range 1-24). The majority of the fractures were diagnosed in jumpers (n=29), mid and long distance runners (n=23) and hurdlers (n=18). Regarding the anatomic distribution 51.65% (n=47) were located in the tibia and 23.08% (n=21) in the metatarsals. Fibula (n=9), tarsal bones (n=14), great toe sesamoids (n=3), neck of femur (n=1) and symphysis pubis (n=1) were the rest stress fracture sites. There were not any stress fractures of the upper extremity. Two of the tibial fractures recurred after 6 and 9 months respectively.

Conclusions: Our results are consistent with previously published studies regarding the distribution of the stress fractures by anatomic site and sport event with almost equal distribution between the two genders.

Key words: Stress fractures. Track and field injuries. Tibial stress fractures. Overuse injuries.

The Enduro- Motorcyclists wrist and other overuse injuries in competitive Enduro- Motorcyclists: a prospective study

Sabeti-Achraf M, Serek M, Pachtner T, Geisler M, Auner K, Machinek M

Vienna Medical School, Department for Orthopaedic Surgery

Introduction: According to public opinion Enduro- motorcycling is a dangerous sport. Little is known about the anatomical region and the kind of overuse injuries appearing in a competition. This study was carried out to analyse off road motorcycle sport immanent overuse injuries.

Material and method: A study consisting of two phases was initiated using preformed questionnaires in volunteering Enduro- motorcyclists, who were examined immediately before and after the race. In phase one a prospective field study at the Prolog of the Erzberg-Rodeo was carried out to evaluate the overused anatomical regions. Basing on phase's one results, the next year's phase two study was designed as a prospective randomised investigation. There, clinical examinations for pain in the hand/ wrist and forearm region using the Visual Analogue Scale, for Raynaud Syndrome, Carpal Tunnel Syndrome, loss of grip strength in the forearm muscles were recorded.

Results: Overall 298 athletes took part in this investigation. The predominately overused regions were found at the hand/wrist and forearms in phase one. Nearly 50% of all riders complained about pain, or paraesthetic sensations in the hand and wrist. In phase two the results concerning pain in the hand/wrist were confirmed with significant increase of pain during the race, but no significant difference within professionals and hobby athletes. Concerning pain in the forearms, professionals had significantly less pain. After the second run 38.7% of all riders had carpal tunnel like symptoms.

Conclusion: More than half of all analysed athletes complained about overuse injury. There is strong evidence that Enduro- motorcycling has a high potential to cause overuse syndromes, especially in the upper extremity. Due to this study's findings transient carpal tunnel like symptoms are obviously a sport immanent overuse injury occurring in professionals and non professionals in comparable numbers.

Key words: Carpal tunnel syndrome. Off-road. Motorcycle.

Systolic blood arterial pressure during the Astrand bench effort test in school sportsmen

Manonelles P, Larma A, Álvarez J, Giménez L, Garcia-Felipe A, Rubio E
University of Zaragoza. Spain.

Introduction: Submaximal effort exercise test is mainly used for a functional evaluation of sportsmen, but it can also give information about other clinical parameters such as the arterial pressure status which has been identified as a good marker for the future arterial hypertension.

Methods: Systolic arterial pressure (SBP) has been studied in 614 school sportsmen (361 children), between 6-16 years old, basketball players (25,6%), football (25,2%), track and fields (17,3%) and futsal (15,9%).

The study objective was to establish the SBP percentiles in order to determine the outside values.

Results: SBP percentiles distribution is reflected in Table 1 (*Weighter Average*) and its relationship with the heart rate reached on the effort test.

The number of sportsmen with SBP in percentiles 90 and 95, considered as high values for this group is shown in Table 2.

Conclusions: The submaximal effort exercise test can provide clinical information on the sportsman status and can be used to assess their health status.

SBP assessment allows to identify major changes that deserve to be considered when evaluating children's athlete health, especially if it could be a marker for future hypertension.

Key words: Systolic blood pressure. Submaximal effort exercise test. School sportsmen.

Table 1. Manonelles, et al. Percentiles (Weighter Average)

Percentiles		5	10	25	50	75	90	95
SBP	♂	110	120	130	140	160	175	190
	♀	110	120	130	140	155	165	170
HR	♂	120	130	140	150	165	180	180
	♀	120	130	140	150	170	180	190

SBP: Systolic Arterial Pressure (mmHg); HR: Heart rate (bpm)

Table 2. Manonelles, et al. SBP 90 and 95 Percentiles

Percentil	♂ 361		♀ 253		Total	
	N	%	N	%	N	%
90	39	10,83	26	10,27	65	10,57
95	20	5,54	21	8,3	41	6,67

SPORTS MEDICINE-II

LANGUAGE: ENGLISH

Relationship between cardiorespiratory fitness and selected risk factors for coronary heart disease in the male and female of academic members of Isfahan University

Pirani H¹, Kargarfard M¹, Ghias M²

¹Faculty of Physical Education and Sport Sciences, University of Isfahan; ²Health Center, University of Isfahan

Introduction: The purpose of the present study was to determine the relationship between cardiorespiratory fitness and selected risk factors for coronary heart disease (CHD), as determined with the Naughton Protocol Aerobic Fitness Test (NPAFT), in the male and female of academic members of Isfahan University.

Method: In a Cross-sectional study, on the basis of age-specific and sex-specific percentile scores, 178 male and 46 female academic members of Isfahan university servants aged 30 to 70 years who participated in a voluntary fitness testing program between 2006 and 2007 were classified as being in the

low-fitness, moderate-fitness or high-fitness category according to maximum oxygen consumption (VO₂ max) predicted from performance on the NPAFT. Age, body composition (height, weight, body mass index, triceps skinfold thickness, sum of three skinfold measurements, predicted percentage of body fat and waist-hip ratio), blood lipid levels (total cholesterol, triglycerides, high-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol and ratio of total cholesterol to HDL-C) and hemodynamic measurements (heart rate and blood pressure at rest and during exercise and predicted VO₂ max).

Results: The mean anthropometric measurements except for the mean sum of three skinfold measurements, predicted percentage of body fat and waist-hip ratio for women, blood lipid levels except for women, and hemodynamic measurements except for the mean resting diastolic blood pressure for men, and diastolic and systolic blood pressure at rest and after exercise for women, differed significantly between the fitness groups for both men and women ($p < 0.05$).

Conclusions: In both men and women a higher level of aerobic fitness, as defined by VO₂ max predicted from performance on the NPAFT, is associated with a more favourable CHD risk profile. The results support the use of VO₂ max predicted from performance on the NPAFT as a valid procedure for classifying people according to fitness level.

Key words: Cardiorespiratory fitness. Body composition. Lipid profile levels.

Hormonal evaluation in the chronic fatigue syndrome

Suarez A¹, Alegre J², Garcia Quintana A³, Comella A⁵, Garrido E⁶, Lizarraga T¹, Ventura JL⁴, Blázquez A, Segura R¹

¹Departament of Physiological Sciences II. University of Barcelona; ²Vall de Hebron Hospital; ³CFS Unit. Delfos Hospital; ⁴Hospital University of Bellvitge; ⁵University of Vic 6 Hospital General de Catalonia

Introduction: One of the major symptoms of chronic fatigue syndrome (CFS) is reduced exercise and recovery capacity and increase fatigue symptoms with a rating of perceived exertion increased during hours or days following physical effort.

Objective: Asses the potential differences in the hormonal adaptation during repeated efforts between patients with CFS and a control group.

Method: We compare 32 patients affected by CFS and a group of 23 healthy women subjects matched to social level, activity, age and weight. Each subject was tested during three following days at the same time. The protocol of the supramaximal test consisted of three minutes of warming up at 0 watts after this warm up period they started the supramaximal test based on a ramp protocol exercise test, increasing the workload to a rate of the maximal workload achieved in a previous maximal test.

We also measured blood samples at the beginning of the test and during each rest after the supramaximal tests, so we obtain four samples per day, at the rest and after the first, second and third supramaximal test, we also measured blood samples after 20 minutes and 40 minutes after the exercise test. All the subjects realized a light meal four hours before the test, and all the subjects signed the corresponding consent form

Results: We observed upper values with a significant different in the values of the GH in the CFS patients during the rest and also during the tests ($p = 0.037$).

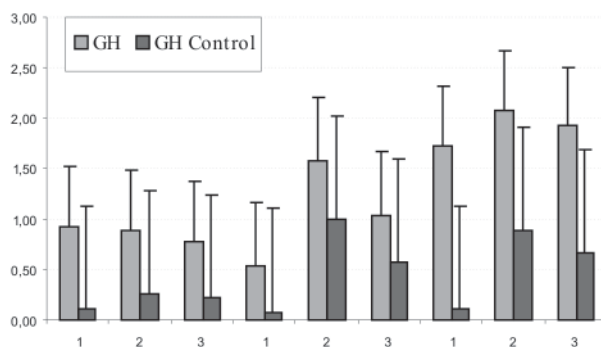


Figure 1. Suarez A, et al.

However, the cortisol values showed significant differences values during the test ($p < 0.001$), with the data pattern to have upper values in the group of SFC. There were also no significant differences in the ACTH and prolactina parameters.

Conclusion: In base of these parameters obtained, the hormonal parameters could help to diagnosis the CFS.

Key words: Chronic fatigue syndrome. Exercise. Hormonal adaptation.

Physically active subjects show better seminological parameters than sedentary subjects

Vaamonde D¹, Da Silva-Grigoletto ME², Swanson RJ³, Cunha Filho JS⁴, Oehninger S⁵

¹School of Medicine- Universidad de Córdoba; ²Andalusian Center of Sports Medicine –Junta de Andalucía; ³Biology Department, Old Dominion University; ⁴Insemine Centro de Reproducao Humana; ⁵Centro Iberoamericano de Reproducción Asistida, Jones institute for Reproductive Medicine

Introduction: We have previously described that exercising at a high level might result in altered seminological profiles in men. However, we hypothesize that exercising at a more moderate pace might, in turn, improve semen quality in comparison to sedentary people. Therefore, it is the aim of the present study to analyze and compare the seminological characteristics of sedentary and physically active people.

Methods: Semen samples of 16 physically active (PA), and 15 sedentary subjects (SE) were evaluated. The exclusion criteria were any factors that could interfere with normality of the reproductive system. The inclusion criteria were: not having any exclusion criteria, a minimum practice of 2-4 hs/week and a VO₂max ≥ 40 ml \cdot min⁻¹ \cdot kg⁻¹ for PA group, while not practicing any physical activity and a VO₂max < 40 ml \cdot min⁻¹ \cdot kg⁻¹ was a requisite for SE. Macroscopic and microscopic observations of sperm were performed (3-6 days of abstinence) assessing velocity type (a+b), and morphology according WHO's guidelines and Kruger's strict criteria. For morphology, two slides of sperm extensions were prepared for each subject, using a quick stain. 200 sperm per subject were observed using the 100x under oil.

Results: For semen parameters, the differences found for type "a+b", as well as percentage of normal forms should be highlighted. Sperm morphology values showed statistical differences ($P < 0.05$) among the two analysed populations. Percentage of normal forms was higher in PA (15.54 \pm 1.38) than in sedentary subjects (14.40 \pm 1.15). Likewise, type "a+b" velocity showed a similar behaviour, being higher for PA (60.94 \pm 5.03) than for SE (56.07 \pm 4.55).

Conclusions: Our main finding is that there are differences in semen parameters between the groups. The PA group shows better values for several seminological parameters which suggests a healthier microenvironment and homeostasis for the sperm production process. Moderate exercise has been previously shown to favour a more anabolic state. Thus, it seems plausible that moderate exercise might have a positive effect on semen production by means of an improved anabolic state; however, other factors intimately related to a physically active lifestyle may also play a role in this improvement, and future studies should be done to clarify this fact.

Key words: Physically active subjects. Sedentary subjects. Male fertility. Semen.

Alterations of sperm morphology among practitioners of three different training modalities

Vaamonde D¹, Da Silva-Grigoletto ME², Swanson RJ³, García-Manso JM⁴, Suarez-Serra R⁵, Oehninger S⁵

¹School of Medicine. Universidad de Córdoba; ²Andalusian Center of Sports Medicine. Junta de Andalucía; ³Biology Department, Old Dominion University; ⁴Physical Education Department, School of Physical Education. Universidad de Las Palmas G.C.; ⁵Centro Iberoamericano de Reproducción Asistida

Introduction: Recently, we have shown that intense physical exercise might alter male reproductive function. We hypothesize that continued practice of different sport modalities, due to inherent characteristics (volume, intensity, etc.), might result in differences in sperm morphology. Therefore, it is the aim of the present study to analyze the morphological characteristics of semen samples from three populations with different type and level of physical activity.

Methods: Semen samples of 16 physically active subjects (PA), 14 water polo players (WP), and 15 triathletes (TA) were evaluated. The exclusion criteria were any factors that could interfere with semen production. The inclusion criteria were: not having any exclusion criteria, minimum practice of 3 hours/week and maximum oxygen uptake of at least 40 ml•min⁻¹•kg⁻¹. Macroscopic and microscopic observations of physical and qualitative parameters of sperm were performed (3-6 days of abstinence), evaluating the three sperm segments for morphological normalcy according to WHO's guidelines and Kruger's strict criteria. Two slides of sperm extensions were prepared for each subject, using a quick stain. 200 sperm per subject were observed using the 100x under oil. One-way ANOVA showed statistical differences for age, thus ANCOVA was used for further comparisons. The pos-Hoc comparisons used the Bonferroni correction.

Results: Sperm morphology values showed statistical differences ($P < 0.05$) among the three analysed populations. Percentage of normal forms was higher in PA (15.22±1.22) than both WP (9.71±2.95) and TA (4.71±2.15). Percentage of normal forms for WP and TA were not only significantly lower than PA but they also were below the reference value of 14%.

Conclusions: Our main finding is that there are differences in sperm morphology among the three groups with PA showing significantly higher values and TA showing the poorest morphology values. TA has the greatest training volume and intensity, which agrees with the volume threshold hypothesis postulated by some. Likewise, some studies with bikers, runners, and swimmers also report some differences. In conclusion, there are differences in the seminological profiles of individual exercising in different modalities; those systematically undergoing high training loads show lowered values for sperm morphology. However, a less demanding activity does not seem to alter such parameter.

Key words: Physically active subjects. Water polo players. Triathletes. Male fertility. Semen.

Premenstrual syndrome and personality factors

Shayanpour M, Ataei F, Abedi MR, Tabatabaieian Nimavard M
Islamic Azad University, Najaf Abad Branch, Iran

Introduction: Premenstrual Syndrome (PMS) is very common problem among women of reproductive age, it includes some physical affective and behavioural symptoms in the weeks before menstruation, these may cause negative effect on performance during exercise and competitions. It is a challenge for trainers, coaches, team physicians and all who work with female athletes. The mechanism and controlling methods of this symptom is still under investigation. The aim of this study was to determine the relation between severity of the symptoms of PMS and personality factors.

Method: This was a case-control study in which a total of 60 women with moderate to severe symptoms of PMS (a score of over 80 in the questioner for PMS) were the case group and 60 women with mild symptoms (score below 80) were the control group.

Women aged 20 – 45 years with regular menstrual cycles, who were not pregnant, breast feeder and menopause and did not consume hormonal and psychiatric drugs were eligible for the study. Women were all assigned to receive the Big Five Factors questioner. This questionnaire evaluates five personality factors including extraversion, openness, agreeableness, neuroticism, conscientiousness.

All data were analyzed by SPSS statistical software ver13.

Results: The extraversion's score in case was 153 ± 16(M ± SD) and in control group was 150 ± 20. The openness score in case 152 ± 15 and in control 150 ± 21. There was no significant deference about these two factors. The agreeableness score in case was 148 ± 16 and in control was 156 ± 19. The conscientiousness score in case was 145 ± 17 and in control was 155 ± 22. The neuroticism score in case was 158 ± 12 and in control was 150 ± 21. There was statistically significant difference ($P < 0.05$) between case and control groups in 3 factors: agreeableness and conscientiousness were indirectly correlated with the severity of PMS and neuroticism was directly correlated with PMS.

Conclusion: According to the importance of effects of mood-swings related to PMS and mentioned personality factors in women, it seems that psychological consult with cognitive-therapy would help the women at the time of exercise and competitions to achieve better performance.

Key words: Premenstrual syndrome. Personality factors. Female athletes.

SPORTS MEDICINE-III

LANGUAGE: ENGLISH

Partner relationship influence in the functional capacity in Chronic Fatigue Syndrome women

Blazquez A, Alegre J, Ruiz E, Guillamo E, Suárez A, Garcia-Quintana A, Javierre C

Department of Physiological Sciences II. Medical School. University of Barcelona. L'Hospitalet. Barcelona. Spain.

Objectives: The aim of this study was to evaluate the marital relationship influence on anxiety perception and the functional capacity in women with CFS. Although there are already some studies trying to show the effects of the familiar interactions on the development and maintenance of symptomatology (as the anxiety) in CFS patients, it would be necessary other physiological measures.

Methods: 40 women diagnosed of SFC at least since one year ago (Holmes and Fukuda), between 25-50 years, with stable couple (cohabiting, sharing economy and keeping sexual intercourses). Instruments administrated: DAS, STAI, IRI (to the partner) SLC-R-90, interview and maximal physical test performed using a cycle ergometer accompanied by monitoring of cardiopulmonary response (only patient).

The maximal physical test started at 0 watts for 4'. After this period they followed a progressive exercise schedule which increased by 20 W each minute up to exhaustion. After a recovery period of four minutes they performed a supramaximal test, initially without load; the workload was then increased in ramp every 30 s with a load corresponding to the maximal value achieved in the previous test, up to exhaustion.

Results: we found a significant correlation between SLC-R-90 variables in patient group and the partner group. Many of these patient variables had an influence on the ventilatory response to a supramaximal exercise.

Conclusion: The neurocognitive dysfunction in CFS women would be related to the partner relationship, showing a significant influence in the ventilatory adaptation to a supramaximal exercise.

Key words: Fatigue. Physical test. Psychological evaluation.

Table 1. Blazquez A, et al.

SLC-R-90 variables	Rest Borg Test	Supramaximal Test			
		Respiratory Freq.	V _T	Fe O ₂	Fe CO ₂
Somatization				0,620 (.014)	-0,645(.009)
Interpersonal sensitivity	0,602 (.023)		0,678 (.005)	0,567(.028)	
Psychoticism		0,600 (.018)		0,526 (.044)	-,569 (.027)

Correlation of the SLC-R-90 variables (that showed a significant correlation between patient and partner group) with functional parameters (data show r (statistical significance)).

The effects of yoga exercise program for female seniors

Djelic Marina, Mazic Sanja, Nestic Dejan, Stojiljkovic Stanimir, Popovic Djelana, Mitrovic Dusan

Institute of Physiology, School of Medicine, University of Belgrade.

Yoga practice is associated with numerous health improvements, including reduced cardiovascular risk, body mass index and blood pressure. Yoga is also associated with improved respiration, psychological health and pain management. Older adults are a fast-growing segment of the population, and their special needs resulting from declining physical functions should be taken into account when selecting appropriate activities to promote health. The aim of this study was to determine the beneficial effects of yoga in the female seniors population. The study included 39 women aged 62 or over (mean ± SD; age, 62.69 ± 4.57 years) who have regularly been practicing yoga for at least one year, three times a week, 70 minutes per session; and 36 women (62.08 ± 7.32 years) who do not practice any kind of recreational activity.

Physical fitness was further defined to include body composition and cardiovascular-respiratory fitness. Body composition included body height, body weight, body mass index (BMI), and body fat percentage. Cardiovascular-respiratory fitness included VO₂max. The subjects performed Astrand exercise test on the cycle-ergometer. Although average body height, mean body weight and BMI of the subjects were slightly lower in yoga group, these mean differences between tow groups were not statistically significant. Also, our results indicated that body fat percentage decreased, and VO₂max increased in yoga group (all $p < 0.05$). Our results supports that the yoga exercise program provides positive effects on the promotion of good health in female seniors.

Key words: Female seniors. Yoga. VO₂max. BMI. Body fat percentage.

Abuse of growth hormone increases the risk of persistent De Quervain tenosynovitis

Pagonis T¹, Toli P², Ditsios K¹, Karataglis D¹, Papadopoulos P¹, Christodoulou A¹

¹1st Orthopaedic Clinic of Aristotle University of Thessaloniki, G.U.H.G.Papanikolaou, Thessaloniki, Greece; ²Medical University of Thessaly, Larisa, Greece

Introduction: De Quervain's tenosynovitis (DQT) affects the abductor pollicis longus and extensor pollicis brevis tendons. Growth Hormone (GH) abuse is associated with DQT incidence, especially in individuals involved in high-resistance-training.

Methods: We treated 19 individuals suffering from DQT. Nine were abusing GH (Group A), the rest were not (Group B). Four Group A patients ceased GH abuse during treatment (Subgroup 1), the rest did not (Subgroup 2). Follow up was in three, nine and sixteen months. All patients were initially treated by splinting and use of NSAIDs. If symptoms persisted cortisone injections (CI) were added to the treatment. Surgical decompression was the last option.

Results: During first follow up, in Group A and in Subgroup 1 we had three patients (75%) that were symptoms-free and one (25%) that was started on CI. All patients of Subgroup 2 (100%) were still experiencing symptoms and were started on CI. Nine Group B patients (90%) were symptoms-free and one (10%) was started on CI. On second follow up, in Subgroup 1 the one patient (25%) that was started on cortisone was operated on while one of the symptoms-free patients (25%) relapsed and was started on NSAIDs and CI. Three patients in Subgroup 2 (60%) were operated on while the rest were under conservative treatment declining surgery. All Group B patients (100%) were symptoms-free. In final follow up, in Subgroup 1, we had two patients (50%) that were operated on. In Subgroup 2 we had four patients that were operated on (80%) and one (20%) still suffering from DQT, declining surgery. Group B included one patient that relapsed and was started on NSAIDs and CI.

Conclusions: Our results suggest that GH abuse is associated with incidence of DQT and increased use of surgical decompression for the alleviation of symptoms.

Key words: Anabolic steroids. De Quervain. Tenosynovitis. Growth hormone.

The underlying trials in the visual impaired individual motor performance: comparative study of the proprioceptive sensibility in a young adult population

Rocha F, Rezende V, Vasconcelos O, Botelho M
Faculty of Sport, University of Porto, Portugal

The purpose the present study was to evaluate the manual proprioceptive sensibility in subjects with and without visual impairment, non practitioners and practitioners of physical activities (goal ball and soccer). The sample comprises 28 subjects 20 - 55 years old, 18 visual impaired (12 active and 6 non active) and 10 "norm-visual" (5 active and 5 non active). The instrument used for the evaluation of the manual proprioceptive sensibility was the Test of Discrimination Weights. Statistical procedures included descriptive statistics and inferential statistics (Independent-Sample t Test). Main conclusions: (i) The practitioners have a higher sensitivity proprioceptive on her left hand (not preferred) compared to non-practitioners who have higher proprioceptive sensibility in the right hand (hand preferred), ii) the visually impaired practitioners have a higher sensitivity proprioceptive on her left hand (hand preferred) in relation to the visually impaired athletes who did not show greater sensitivity proprioceptive the right hand (hand preferred), iii) We can say that, although there are no statistically significant differences, individuals norm-visuals proprioceptive practitioners

show greater sensitivity in the left hand (not preferred). Norm-visuals individuals already do not show greater sensitivity proprioceptive practitioners in the right hand (hand preferred), iv) Although there are significant differences, both visually impaired athletes such as norm-visuals practitioners have a higher sensitivity proprioceptive on her left hand (hand not preferred); and v) Although do not present significant differences, we can see that both the visually impaired athletes and not the perpetrators have not norm-visuals greater proprioceptive sensibility in the right hand (hand preferred).

Key words: Visual impaired. Physical activity. Manual proprioceptive sensibility.

Elevated systolic blood arterial pressure during the Astrand bench effort test in school sportsmen

Manonelles P, Larma A, Álvarez J, Giménez L, García-Felipe A, Rubio E
University of Zaragoza. Spain.

Introduction: The systolic blood pressure (SBP) obtained at the end of the submaximal effort exercise test exceeds, sometimes, the considered normal values by percentiles. It would be interesting to determine the threshold points, from which should be suspected high SBP in order to take measures to prevent future hypertension in school athletes.

Methods: SBP has been studied in 614 school sportsmen (361 boys), aged 6-16 years, practicing basketball (25.6%), soccer (25.2%), track and fields (17.3%) and futsal (15.9%). The purpose of the study was to establish the threshold points from which high SBP could be considered.

Results: Table 1 shows the distribution of percentiles of SBP.

Table 2 shows SBP average rates for boys and girls, 95% CI (confidence interval), standard deviation and SBP range. BSP Threshold points, in this age group, for boys and for girls are 145 and 140 mmHg respectively, with 95% CI 142.5-147.5 in boys, and 138.5-143.5 mm Hg in girls.

Conclusions: SBP values obtained in submaximal effort exercise test in school-sportsmen exceeding an average of 145 and 140 mmHg, in boys and girls respectively (with 95% CI of 142,5-147,5 in boys, and 138,5-143,5 mm Hg in girls) should be considered as high values and could be used as a criterion for a follow-up and prevention of future hypertension.

Key words: Elevated systolic blood pressure. Submaximal effort exercise test. School sportsmen.

Table 1. Manonelles, et al. Percentiles (Weighter Average)

Percentiles		5	10	25	50	75	90	95
SBP	♂	110	120	130	140	160	175	190
	♀	110	120	130	140	155	165	170
HR	♂	120	130	140	150	165	180	180
	♀	120	130	140	150	170	180	190

SBP: Systolic Blood Pressure (mmHg); HR: Heart rate (bpm)

Table 2. Manonelles, et al. BSP Threshold point

BSP	♂	♀
Men	145.04	141.15
95% CI- lower	142.67	138.72
95% CI- upper	147.41	143.58
SD	22.90	19.63
Range	90-260	80-210

SPORTS MEDICINE-IV LANGUAGE: ENGLISH

Sagittal alignment and radiological findings of the spine in Spanish high sport people

González M¹, Fernández T², González M¹, Santaella O, Heredia JA, Gutiérrez E

ORAL COMMUNICATIONS

¹Centro de Medicina del Deporte. Consejo Superior de Deportes. Madrid. España; ²Cátedra Traumatología del Deporte. Universidad Católica San Antonio. Murcia. España.

Introduction: Elite sport practice requires very high physical loads and a very specific technical work, with important demands in osteoarticular area, muscles and tendons. Spine, as central axis of our skeletal system, may show some alterations which imply a risk for sport practice, even without evident clinical symptoms.

Objective: The knowledge of the incidence of the different radiological findings in elite sport people spine during the first medical examination at the Sport Medicine Centre.

Material and methods: Spine morphology and structure are studied after the radiological study made to 570 athletes arriving for their first time at the Centre between July 2001 and December 2003. Everyone belongs to the national sport speciality team. A lateral view is taken including the lumbar spine in a standing position.

Results: 59,1% of the radiographic studies shows positive findings. Hyperlordosis is found in the 35,3%. Women have statistic significance. Spondylolysis with or without spondylolystesis are present in the 8,8%, especially in rhythmic gymnastics and rowing. Vertebral ring apophysis injury is seen in a 2,5% specially in gymnastics. Finally, lumbar disc alterations are seen in the 10% of the sportspeople, with a statistic significance in men and the oldest group.

Conclusions: A systematic study of the spine is necessary to be done in order to prevent frequent pathologies on reaching the high sport competition.

Key words: Spine. Radiology. Sport.

The role of ultrasound in the evaluation of sports injuries in the university sport

Ruiz Gómez MC¹, García Romero JC²

¹Universidad de Málaga. Servicio Médico Complejo Deportivo Teatinos; ²Escuela de Especialistas en Medicina de la Educación Física y el Deporte.

Introduction: Technical advances over the last years have considerable improved the performance of ultrasound (US), thus expanding its field of applications, which now encroaches on that of magnetic resonance. The aim of this study was to determine the usefulness of sonography for detecting sport injuries among young university players of the Málaga University (UMA). US is a dynamic, comparative and inexpensive imaging modality that ensures optimal evaluation of the musculoskeletal tissues.

Methods: We studied all the US examination performed in the sport medicine center of the Málaga university realized during the lasts two years. We divided in acute or cronical pathology and sport and also divided in muscle, tendon and other structures. We use the Sonosite titan model belonging to the medical sport physicians in the UMA.

Results: We have studies 573 and 644 sport injuries in these years and use the US examination in the 20% of these injured people visiting us. The main problem was muscle contusion as traumatic macrotrauma and oversue syndrome causes by repetitive microtrauma (45%). We can diagnosed some stress fractures, shin splints, ligament injuries, muscular hematoma, femur osteochondroma, jumper knee and other tendon injuries such as Achilles were also examined.

Conclusion: Sonography in the field can provide an opportunity to detect and treat some injuries before they become more advanced such as muscular ruptures. Sonography has an important role in the evaluation of sports-related injuries. Although some disadvantages such as operator dependence with a steep and prolonged learning curve. Some advantages include accessibility, high resolution, and lower cost than other radiological studies. Direct imaging correlation with patient symptoms provides important information to the sport physician.

Key words: Musculoskeletal imaging. Ultrasound sonography. Sports injuries.

Effectiveness of a doping prevention and health promotion program for high school athletes

Moe E, Elliot D, Goldberg L, Otis M, Perrier E, McGinnis W
Oregon Health & Science University, Portland, OR, USA

Introduction: The ATLAS (Athletes Training and Learning to Avoid Steroids) and ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) programs are school-based sport team-centered doping prevention and health

promotion programs. These sex-specific scripted curricula are integrated into a sport team's usual practice activities. In prospective randomized trials, both programs have proven efficacy in harm reduction and health promotion (<http://www.nrepp.samhsa.gov/>). The effectiveness of these programs when implemented under real-word conditions has not been reported.

Methods: Both programs were implemented by sports teams from high schools in two Texas school districts. Anonymous surveys about drug and alcohol use, nutrition and strength training were completed by student-athletes prior to and following the sport season. Coaches also completed surveys concerning program use.

Results: Based on implementation and program completion surveys, coaches and student-athletes found both programs acceptable and feasible. At season end, the majority (79%) reported attending at least 8 of the 10 ATLAS sessions and (81%) reported attending at least 5 of the 8 ATHENA sessions. For ATLAS, outcomes in the protective direction were found for increased ability to identify side-effects of drug use ($p < .05$), enhanced knowledge of proper nutrition and strength training practices ($p < .05$ for both), and an increased understanding of media influences ($p < .05$). For ATHENA positive differences were found in disordered eating ($p < .01$); intent to use ergogenic drugs and attitudes deterring drug use ($p < .005$ for each); recognition that their team has rules against drug use, perceived vulnerability to harmful effects of ergogenic drugs, and belief magazine ads are false ($p < .001$ for each).

Conclusions: Sport teams may be unique settings for peers to align healthy lifestyle and improved sport performance objectives. These dissemination findings replicated the initial controlled trials' favorable results and suggest that both programs are effective when implemented with minimal training necessary in a community setting.

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

Innovative stratification method for users of anabolic steroids

Toli P¹, Pagonis T², Ditsios K², Karataglis D², Papadopoulos P², Christodoulou A²

¹Medical University of Thessaly; ²1st Orthopaedic Clinic of Aristotles University of Thessaloniki, G.U.H.G. Papanikolaou, Thessaloniki, Greece.

Introduction: Anabolic Steroids (AS) are used by athletes in regimes referred to as "cycles" consisting of exotic combinations of multiple oral and/or injectable formulations of different AS, used in supra physiological doses for the span of several weeks. The biggest challenge for a researcher is the stratification of users into groups of similar severity according to the parameters of the abuse patterns observed in each case.

Methods: We decided to divide users into groups according to the severity of the abuse. The Abuse Stratification System (AbuStraS), a novel system of categorization of AS abusers (created by Pagonis T) takes into consideration the following abuse parameters: the number (n) of compounds used, the type of AS (ty), the used dosages (D), the Therapeutic Index (Androgenic activity / Anabolic activity = TI) of the agents, the number of "cycles" used in the past (C), and finally the duration of time (dT) that each "cycle" lasted. The severity in each parameter is arbitrarily scored from the lighter to the heavier with 1, 2 and 3 points.

Results: The total score (Sum) a user receives by addition of the points in each parameter, is used to categorize their AS abuse. According to AbuStraS the smallest total score a user belonging to the lighter levels of all subscales can acquire is between 6 and 12 points, a user belonging to the middle levels of all subscales is from 12 to 18 points and a user belonging to the higher levels of all subscales is above 18 points.

Conclusions: An athlete with less than 12 points is characterised as "light abuser", one scoring 12-18 points as "medium abuser", and one scoring more than 18 points as "heavy abuser".

Key words: Anabolic steroids. Stratification. Doping. Users.

Effect of different intensity efforts in ergometre on electrocardiograms variables of cyclists amateurs

De la Cruz Márquez JC¹, García Pérez L¹, Vila Castellar J², García Mármoel E¹, López García R¹, De la Cruz Campos JC¹, Cuelo Martín B¹

¹Facultad de Ciencias de la Actividad Física y el Deporte de la Universidad de Granada; ²Facultad de Psicología de la Universidad de Granada.

Introduction: The electrocardiogram (ECG) of rest and the ergometry monitored they constitute two diagnostic actions of highly sensibility and specificity in the sports population to detect pathologies of incompatible risk with the sports activity. Nevertheless, the duration of the tests of effort can be very important for the apparition of ECG disturbances. Therefore, the purpose of this work is to determine if the duration of the test of effort influences on the apparition of ECG alterations in amateurs cyclists.

Material and Method: 17 amateurs cyclists from 21 to 56 years of age (with a 39.11-year-old average), all they practicing habitual with, at least, 3 years of training. DIMEQ 503 Electrocardiogram. ELITE Digital MAG utilizing the bicycle of personal highway of each cyclist.

They were submitted to three tests of effort. The first one consisted of an incremental test beginning to 50 w and enlarging other 50 w every 2 minutes. The second, carried out to the 7- 10 days, they were 60' to a 60% of the maximum load reached in the first test and the third test, carried out to the 10- 15 days, of the second, and they were 20 km to the 100% of their possibilities.

In the end of each test an ECG in supine position and in rest was carried out.

Results: Table 1.

Conclusions: After a test of 20 Km of I pedal maximum alterations are presented more ECG disturbances that after an incremental test or an hour of I pedal to the 60%.

Key words: Electrocardiogram. Ergometry. Cycling.

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

	Rest	Incremental	1 Hour	20 Km.
Normal	17	17	17	3
Subepicardic ischemia	0	1	0	4
Preexcitation S.	0	1	0	2
Post ischemia	0	0	0	2
Transwall ischemia	0	0	0	1
Conduction alts	0	2	0	5

Level of physical activity, anthropometry, cardiovascular fitness and aerobic capacity between Spanish and Argentinean children

Cis Spoturno A, Cañete Bujalance M, Alvero-Cruz JR, Portela J, Cis Spoturno G, Almada G, Gorla H

School of Sport Medicine. Faculty of Medicine. University of Malaga. Spain. Orthopaedics and Cardiology Section. Centenary Hospital. Gualaguaychu. Argentine

Introduction: We compared the aerobic capacity estimated with Course Navette test in children from an important town in Spain and a small city in Argentina, in their last course of primary school, in order to study the influence of anthropometric, cardiovascular and physical activities in their physical fitness.

Methods: Group A: (Argentineans): n: 24 (15 boys and 6 girls) (mean \pm SD age): 12,4 \pm 0,43 years), Group B (Spanish): n:15 (11 boys and 4 girls) (mean \pm SD age): 12,6 \pm 0,45 years). We estimated in both groups: 1) Physical activity level: through a questionnaire which included time spent (hours) in sedentary activities (TV, computer), physical activities or sports practice performed at or out of school; 2) Anthropometry; 3) Cardiovascular variables at rest: heart rate, systolic and diastolic blood pressure (SBP and DBP); and we estimated left ventricular internal dimension in diastole (LVIDd) and function, left ventricular mass (LVM); left systolic wall stress (LSWS) by echocardiography M, 2-D and Doppler method; 4) Indirect aerobic capacity with Course Navette test with maximal heart rate. 5) Statistical analysis

Results: The whole aerobic capacity was superior in Group A ($p < 0,001$). The same group had significantly lower SBP and DBP ($p < 0,001$), the LSWS levels in boys and girls ($p < 0, 01$) and the LVIDd ($p < 0, 05$). There were no differences in time spent in sedentary, physical activities at school or sports performance, but there was a significant increment in the out of school physical activity, in Group A ($p < 0, 05$). Global anthropometric data was similar in both groups.

When analyzed differences between groups by gender: the higher aerobic capacity was sustained among boys ($p < 0,001$) and girls ($p < 0, 05$) from Group A. Only boys from the Group A showed increased muscular mass and lower LVIDd ($p < 0,05$). The SBP, DBP ($p < 0,001$), weight, height, body mass index (BMI) and bony weight ($p < 0, 05$) was higher in the boys from Group B. Among girls, Group A was younger and they had lower SBP ($p < 0,05$).

We found positive correlation between aerobic capacity and the LVIDd, ($p < 0,001$ y $p < 0, 05$), the LVM ($p < 0, 01$ y $p < 0, 05$) respectively in both groups; the sports practice and the out school physical activities only in Group A ($p < 0, 01$), and it was inverse in both groups in relation to the endomorphic levels ($p < 0, 01$ y $0, 05$) respectively.

Conclusion: We confirm the reliability of the Course Navette test showing significantly differences in cardiorespiratory fitness between similar age school children from both countries. The superior aerobic capacity in the Argentinean group could be related to the increment in physical activities performed out of school and higher cardiovascular fitness. The differences were sustained specially between boys.

Key words: Physical activity. Anthropometry. Cardiovascular fitness.

TRAINING AND PERFORMANCE IMPROVEMENT I LANGUAGE: SPANISH

Seasonal changes in jump performance in elite female volleyball athletes

González-Ravé JM, Martínez Valencia MA, Clemente Suárez V, Juárez D, Navarro Valdivielso F

Sport Training Laboratory. Faculty of Sport Sciences. Toledo (Spain)

Volleyball is an intermittent sport that requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low intensity activity. The effect of reducing strength and power training programmes has been reported for competition periods up to 16 weeks which is considerably shorter than the 32 week volleyball league season in Spain. An investigation is required to examine the effect of training program over the course of a long competition period.

The purpose of this study was to document seasonal changes in jump performance (Squat Jump, Countermovement Jump and Abalakov) of women volleyball players at Bargas Atalia Team. The independent variable was a annual cycle designed like block periodization. The block concept suggests consecutive training stimulation of carefully selected fitness components. The rational sequencing of specialized mesocycle-blocks presupposes the exploitation and superimposition of residual training effects. 11 women volleyball players from Bargas Atalia Team participated in this study. Jump performance was measured at 4 time points over a 1 year period in Spanish female Volleyball Super league. In order to determine whether there were seasonal changes in these test, subjects were tested in august, immediately following 4 weeks of strength and conditioning (September), following 4 weeks of prior to the regular competitive season (October), and following 16 week of regular competitive season (February). In SJ Mean jump height showed significant differences between august and February ($p < 0,01$) and September and February ($p < 0,05$). The results for CMJ showed significant differences between august and February ($p < 0,01$). Jump height in Abalakov showed significant differences between august and February ($p < 0,00$) and September and February ($p < 0,01$). It was concluded that eight weeks of pre-season may have a limited role in determining the success of the power in- season and after 16 weeks of regular season and training program the power increased significantly.

Key words: Volleyball. Periodization. Power.

Effects of plyometric training on lower body power and speed in female young athletes

Martínez Valencia MA, Clemente Suárez V, Navarro Valdivielso F, González-Ravé JM

Sport Training Laboratory. Faculty of Sport Sciences. Toledo (Spain)

The purpose of this study was to determine the effects of plyometric training on speed and power performance in female young athletes. Plyometric training has been demonstrated to improve jumping ability (Bosco, *et al.*, 1979). Such "bounce" training is widely utilized in strength programs designed to develop power or speed-strength. Although the training effects of plyometrics are not completely understood, the increase in muscle strength and power may be attributed to an increase in muscle elasticity and adaptation in neuromuscular functions. Scientific studies have reported

that properly designed plyometrics exercises can improve the power development of children and adolescent beyond the gains of normal growth and development. In young athletes, it may be possible to incorporate an introductory program of plyometrics into the training program for this age group. The volume of plyometrics (number of foot contacts per session) was low and adapted to young athletes following to Gambetta's model and Medicott (2006). The plyometric exercises must never compromise the technical model and high stress exercises should be reserved for the mature Medicott (2006). 11 female young athletes from "Club Atletismo San Ildefonso" participated in this study (mean \pm SD 13.2 \pm 1.59 years; age range, 13-17 years) were tested for height jump (CMJ, Abalakov), and the time for a 100 m. sprint. The subjects performed 8 sessions during the four weeks of the plyometric training (1st to 5th weeks: 50 jumps; 6th to 8th week: 80 jumps, the exercises are composed by various forms of hops, steps, skips and jumps). The results showed that explosive power performance, as measured by vertical jump (CMJ and Abalakov) showed significant increases ($p < 0.01$) between the pretest and posttest. Also, the subjects showed significant improvements ($p < 0.01$) in speed. These findings suggest that the plyometric training may be more beneficial for enhancing selected measures of lower body power in female young athletes.

Key words: Young. Plyometric. Athletics.

Effect of ultramarathon race on the biochemical parameters in elite endurance athletes

Clemente Suárez V, Navarro Valdviello F, Martínez Valencia MA, González-Ravé JM

Sport Training Laboratory. Faculty of Sport Sciences. Toledo (Spain)

In recent years, more athletes have become involved in ultraendurance races, such as the iron-man triathlon, the 100 km race and the 24 h marathon, and a few investigations have addressed the related biochemical changes. The Race across Extremadura is an extraordinary, very challenging ultraendurance running event held on 19-20 January 2008 in the West of Spain. The distance is 340 km performed in 24 hours. The purpose of this research was to investigate biochemical changes of participants in a 340 km ultramarathon run during 24 hours. Participants. Eight experienced ultra-athletes participated in the study (eight men, age mean \pm SD 33 \pm 6.9 years; volume of training: 2 hours/day). The participants were running in reliefs of 20 minutes during 224 hours of the event up to covering 3340 kilometres from the south of Extremadura in the northern part. Blood samples were obtained from 8 participants in a 340 km foot race before, and during the running (three times). Samples were analysed by standard methods for changes in plasma volume (instruments: Reflotron Plus. Roche Diagnostics S.L and Accusport Lactate Analyzer. Total Performance Inc.). The biochemical variables measured were glucose, triglycerides, urea, lactate, creatinase and haemoglobin. Significant ($p < 0.05$) increases in the following variables were found during the event: creatinase, glucose and lactate. No change occurred in urea, haemoglobin and triglycerides. In conclusion, a wide range of biochemical perturbations occur during ultramarathon running but a number of variables remain within normal limits despite severe physical stress.

Key words: Ultra-endurance. Biochemical variables. Running.

Acute effect of whole body vibration on sprint time and jump ability

Da Silva-Grigoletto ME¹, Vaamonde D², Gómez-Puerto JR¹, Viana-Montaner BH¹, Centeno-Prada R¹, Beas-Jiménez JD¹, Melero-Romero C¹, García-Manso JM³

¹Andalusian Center of Sports Medicine, Córdoba, Spain; ²Morphological Sciences Department. School of Medicine. University of Córdoba, Spain; ³School of Physical Activity and Sport Sciences, University of Las Palmas de Gran Canaria, Spain.

Introduction: Several studies have shown the positive effect of whole body Vibration (WBV) training on jump ability. Although it is known that jump ability and sprint time show moderate to high inverse correlation, there are no randomized studies, to the best of our knowledge, assessing the simultaneous effect of WBV on sprint time and jump ability. The aim of this study was, therefore, to verify the effect of a WBV session on jump ability and sprint time.

Materials and methods: 30 healthy male, mean age (23.5 \pm 1.9), weight (73.7 \pm 6.4), and a minimal systematic training on speed of at least two years participated in the study. The participants underwent a week-long reproducibility period (3

sessions in alternate days), and were randomly allocated afterwards to one of the two groups: WBV treatment (WBV) or Control (C). The WBV group performed 6 exposures of 1 min each; frequency: 30Hz, amplitude: 4mm; recovery time: 2min. while de C group performed the same exercise on the platform without vibration. CMJ was measured with a contact mat and sprint time (15m) with a photocell, both connected to a muscle lab system using specific software. Measurements were taken before and after the session in order to assess the acute effect.

Results: Sprint time for 15m, and CMJ improved significantly from pre-test values (2.41 \pm 0.10s and 39.08 \pm 4.56cm, respectively) to post-test values (2.37 \pm 0.08s and 41.03 \pm 5.31cm, respectively) in the WBV group ($p < 0.05$). No differences were found for the control group between pre-test (2.43 \pm 0.11 and 39.35 \pm 5.16, respectively) and post-test (2.44 \pm 0.12s and 39.51 \pm 5.17cm, respectively) values. No differences were found when analyzing the inter-group values for pre-test; however, the post-test values showed statistical differences ($p < 0.05$) in both sprint time and CMJ, with WBV group showing improved values.

Conclusion: A WBV session might induce a decrease in sprint time in trained individuals, in addition to the previously shown increase in acute jump ability.

Key words: Whole body Vibration. Training. Jump.

Effect of a maximal strength mesocycle on muscle strength, muscle power, and jump ability in a Superleague volleyball team

Gómez-Puerto JR¹, Da Silva-Grigoletto ME¹, Viana-Montaner BH¹, Beas-Jiménez JD¹, Centeno-Prada R¹, Melero-Romero C¹, Vaamonde D², García-Manso JM³, Ugrinowitsch C⁴

¹Andalusian Center of Sports Medicine, Córdoba, Spain; ²Morphological Sciences Department. School of Medicine. University of Córdoba, Spain; ³School of Physical Activity and Sport Sciences, University of Las Palmas de Gran Canaria, Spain; ⁴School of Physical Education and Sport, University of Sao Paulo, Sao Paulo, Brazil.

Introduction: Muscle strength development is a traditional objective in training among almost all sport modalities. More specifically, in volleyball, the inherent characteristics of this modality makes necessary for players to incorporate strength specific exercises to their training routines. Many volleyball coaches think that maximal strength training is detrimental for jump ability, and, therefore, such mesocycles are not normally included as part of their training routines near or within a competition period. However, literature presents data regarding an increase of jump ability due to strength training. Thus, the purpose of this study was to verify the effect of a maximal strength mesocycle on the following variables for lower body: muscle strength, muscle power, and jump ability. Secondly, the effect of the abovementioned mesocycle on upper body was also assessed, analyzing muscle strength, and muscle power.

Methods: Eleven professional volleyball players (Superleague) participated in this short-term study. Muscle performance was assessed through jump (CMJ), muscle strength (4RM), and muscle power tests both before and after a maximal strength mesocycle. Traditional exercises for lower body (half squat, calf raises) and superior body (bench press and pullover) strength development were used.

Results: There were not significant differences for CMJ values between pre-test and post-test (38,12 \pm 2,63 vs. 38,25 \pm 2,78 cm; $P > 0,05$). On the other hand, muscle strength and power of the lower body experimented a statistically significant increase: 8.15% (103,15 \pm 18,02 vs. 112,30 \pm 17,80 kg; $P < 0,05$) and 2.22% (979,88 \pm 89,62 vs. 1002,14 \pm 109,31; $P < 0,05$), respectively. Likewise, statistically significant improvements have been observed for upper body: 10.63% (41,61 \pm 5,75 vs. 46,56 \pm 4,99; $P < 0,05$) for muscle strength, and 9.16% (200,88 \pm 33,76 vs. 221,13 \pm 43,76; $P < 0,05$), for muscle power.

Conclusions: The use of a short-term maximal strength mesocycle during a season's beginning might improve muscle strength and power without a detrimental effect in professional volleyball players.

TRAINING AND PERFORMANCE IMPROVEMENT-II LANGUAGE: SPANISH

Validity and reliability of specific ergometry for training prescription and evaluation in top-level kayakers

Carrasco L¹, Sañudo B¹, De Hoyo M¹, Martínez IC¹, García J²

¹Department of Physical Education and Sport. University of Sevilla. Spain; ²Faculty of Physical Activity and Sport Sciences. University of Murcia. Spain.

Several investigations have attempted to test the validity of these ergometers, comparing open water kayaking and kayak ergometry. The results of these studies showed a lack of correspondence of physiological responses to open water and ergometric tests. Probably, drag resistance generated by ergometer (laboratory test) and open water (field test) can produce these differences modifying, indeed, the kayaking technique. However, there have been advances in the development of air-braked kayak ergometers that can offer new possibilities in the application of laboratory test for prescription and evaluation of kayak paddlers. So, the aim of this study was to determine the validity and reliability of a specific kayak ergometer (Dansprint®) through a test protocol for the assessment of certain physiological and technical parameters that can define kayaking performance. Fourteen male top-level kayak paddlers (all members of Spanish Kayaking National Team) participated in this investigation. All subjects carried out two ergometric tests (Ergo1 and Ergo2) and one open water test (OWT) in random order. At anaerobic threshold (AnT) intensity, the results showed acceptable levels of reliability (comparison between data of Ergo1 and Ergo2 tests) in the assessment of velocity ($r=0.784$; $p=0.004$), stroke frequency ($r=0.976$; $p<0.001$), heart rate ($r=0.964$; $p<0.001$), and blood lactic acid concentration ($r=0.899$; $p<0.001$). Validity coefficients showed a strong relationships between Ergo2 and OWT tests in all physiological and technical parameters with the exception of velocity ($r=0.498$; $p=0.121$). It can be concluded that specific ergometry can be used to evaluate and to prescribe training AnT intensities of top-level kayakers attending to parameters such as heart rate, whole blood lactic acid concentration, and stroke frequency. Nevertheless, the training prescription through specific ergometry must be taken cautiously when velocity is the parameter of reference.

Key words: Kayaking. Testing. Ergometry.

Evolution of physiological, anthropometric and technical parameters in top-level kayakers during training macrocycle

García J¹, Carrasco L², Sañudo B², De Hoyo M², Martínez IC²

¹Faculty of Physical Activity and Sport Sciences. University of Murcia. Spain; ²Department of Physical Education and Sport. University of Sevilla. Spain.

The aim of this study was to analyze the evolution of technical, physiological and anthropometric parameters during a macrocycle training period in a group of top-level kayakers. Ten male top-level kayak paddlers (all members of Spanish Kayaking National Team) participated in this investigation. The macrocycle (contemporary design) was divided in two phases or mesocycles: accumulation (5 weeks) and transformation (3 weeks). Volume training was assessed in all training sessions attending to three intensity ranges. Three testing sessions was developed during the period studied: at the beginning (week 1) of the accumulation mesocycle (T1); at the first week of the transformation mesocycle (T2: week 6) and at the end of this period (T3: week 10). In each testing session an anthropometric study was made following the ISAK protocol; also, kayakers carried out a maximal graded exercise test on specific ergometer (Dansprint®) assessing physiological (heart rate; peak blood lactate concentration) and technical (stroke frequency) parameters. Despite training developed during 10 weeks no changes were observed in heart rate, peak blood lactate concentration and stroke frequency obtained from ergometric tests. However, anthropometric and body composition measures showed changes between T1, T2 and T3. Body mass increased between T1 and T2 ($p<0.01$), decreasing between T2 and T3 ($p<0.01$); body fat percentage and sum of six skinfolds decreased between T1 and T2 ($p<0.05$) and between T2 and T3 ($p<0.01$; $p<0.05$, respectively). Muscular mass increased between T1 and T2 and between T1 and T3 ($p<0.01$) but no were observed between T2 and T3. We can conclude that this training, developed under contemporary concept of periodization, failed to induce significant changes in heart rate and peak blood lactate assessed in specific ergometry. Body composition variables such as body fat percentage showed a positive evolution during training periods.

Key words: Kayaking. Training periodization. Anthropometric analysis.

Effect of ascent to a moderate altitude on muscle power: normobaric hypoxia vs hipobaric hypoxia

Feriche B¹, Calderón-Soto C², Chiroso I¹, Chiroso LJ¹, Escobar R¹, Olea F³, Mariscal M³, Bonitch-Gongora J¹, Bonitch J¹, Galilea P⁴, Riera J⁴, Gutiérrez JA⁵, Arroyo M⁵, Padial P¹

¹Dpto. EF. Universidad de Granada; ²Servicio Médico, CAR Sierra Nevada. CSD; ³Dpto. Nutrición. Universidad de Granada; ⁴CAR Sant Cugat, CSD; ⁵Personal de Formación e Investigación. Vicerrectorado de Investigación. Universidad de Granada; ⁶Dpto. Fisioterapia. Universidad de Granada. Spain.

The main objective of this study is to analyze the effect of changes in barometric pressure and/or air composition on muscular power in different levels of loads. To study this objective, two groups of male wrestlers, competing at national and international levels, took part in this research. One group executed the protocol under normoxia (N1) and breathing mixed gas at 15.7%FIO₂ (NH) in the CAR of Sant Cugat at sea level. The other did it under N (N2) and after a sudden ascent to a moderate altitude (CAR of Sierra Nevada, 2320m, HH). The protocol consisted of a test of increasing loads (F-V curve) in the bench-press (concentric phase), determining the 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 results show no FIO₂ effect in the MP (414.50 ±99.03 vs 407.17±84.92 W to N1 and NH), the variables analyzed on it and in the F-V curve between N1 and NH ($P>0.05$). The change in barometric pressure displays similar MP between conditions (481.50 ±99.80 vs 464.36 ±89.87 W for N2 and HH) although they were obtained at the highest loads (46.64 ±11.2 vs 51.82 ±14.01 Kg for N2 and HH, $P=0.034$). This group presents a F-V curve significantly favoured by HH in the power zone, showing an average increase of 5.92± 4.54%; 7.37 ±1.55% and 1.04 0.33% of P, V and F respectively ($P<0.05$). We can conclude that the changes in the air density with the ascent led to a 20% load increase to achieve MP similar to sea level. Acute moderate altitude improves the capacity to perform actions at high velocity and, makes training at moderate altitude an ideal complement to achieve peak performance in the technical components in power-explosive sports.

Key words: Normobaric hypoxia. Hypobaric hypoxia. Strength training.

Assessment of the capabilities of physical tennis category of sub-16

Sulbarán J, Amaral A, Ponce C

Exercise Physiology Laboratory, University of Los Andes

This research was aimed to conduct an assessment of the physical abilities of tennis players from the sub-category 16 of the tennis club "Luis Govea Gherzi," liberator of the State of the Municipality Merida, Venezuela, through the application of specific tests as a test of cardiovascular endurance, speed, flexibility, muscular endurance and strength in athletic athletes of this sports club. A methodology is applied a type of field research, descriptive in nature, with a design studio framed in the form of quantitative research is not experimental. Participants were selected intentionally, formed by 21 players from the sub-category 16. The results highlight that athletes mainly deficient in physical abilities evaluated except for one in which he excelled, the study showed that in this sport a major shortcoming is the lack of control and assessment capabilities physical athletes, all of this indicates that there is a well-directed development of these and one can infer that this impacts negatively on their sporting activities and therefore at a competitive level. It highlights the importance of this research because it contributes to the application of knowledge, through obtaining important data on the physical performance of athletes, its technical staff to apply the methodology of sports training and updated proposals for developing the maximize the potential of physical and sports athletes as well as the level of training and the value of sport as a means for developing a healthy and integral human being.

Key words: Tennis. Physical abilities. Test assessment.

Power measurement to assess the useful strength in BMX cycling

Mateo M^{1,2}, Zabala M^{1,3}, Blasco C⁴, Velarde S^{1,3}, Garrido R⁵, Oviedo A², Simón A²

¹Real Federación Española de Ciclismo (RFEC); ²Federación de Ciclismo de la Comunidad Valenciana. (FCCV); ³Facultad de Ciencias de la AF y el Deporte. Universidad de Granada. ⁴Facultad de Ciencias de la AF y el Deporte. Universidad de Valencia; ⁵Hospital General de Alicante.

Introduction: It's very important to know the different factors that determine performance in Bicycle Moto Cross (BMX) discipline. Although technique has

ORAL COMMUNICATIONS

been more described, it's still unknown the type of strength that is used specifically in BMX competitions.

Methods: In this study we have measured the strength used in BMX tracks by means of the PowerTap powermeter (PT) in a sample of 26 cyclists (20 of them of the Spanish national team, and 6 national top level). A wide range of tests were developed consisting in: 1) first straight line (FL), 2) 90 meters sprint (90m), 3) maximal intensity of competition lap (CT); the last one in 3 different tracks. The power, time to peak power, and mean power were measured in each repetition of each subject. Values of power (watts), acceleration time (s), acceleration angle α , and maximal Rate of Force Development (RFD_{máx}) were measured using the method of triangulation of curves force/time.

Results: For the test (1) the average values were: acceleration time (FL- 1.5 \pm 0.28 s, 90m- 3.24 \pm 0.67 s, CT- 1.64 \pm 0.39 s); peak power (FL- 1052.88 \pm 169.69 watts, 90m- 1343.2 \pm 198.64 watts, CT- 1159.43 \pm 112.17 watts), acceleration angle α is (FL- 89.91 \pm 0.01°, 90m- 89.86 \pm 0.05°, CT- 89.91 \pm 0.02°), and RFD_{máx} is (FL- 712.77 \pm 107.22 watts \cdot s⁻¹, 90m- 447.01 \pm 137.07 watts \cdot s⁻¹, CT- 800.51 \pm 131.66 watts \cdot s⁻¹). By the way, PT registers one data for each 1.26 seconds, so we don't know when peaks of power appear and we can't measure RFD (Figure 1).

Conclusion: The PT can be useful to quantify and compare different trainings, but it doesn't allow us to analyze accurately the peak power and RFD to assess the useful strength in BMX. More accurate tools need to be developed measuring in higher frequencies.

Key words: BMX. Useful strength. Cycling. Power.

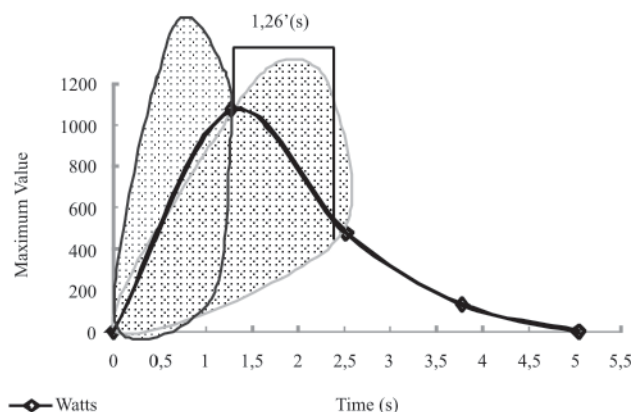


Figure 1. Mateo M, et al. Zones of Powermeter measurements that do not show relevant data of performance in BMX (shadow zones) in the first straight line (FL).

TRAINING AND PERFORMANCE IMPROVEMENT-III LANGUAGE: SPANISH

Biological and psychological alterations in a handball male team along an entire season

Bresciani G¹, Garatachea N¹, Almar M¹, Cuevas MJ¹, Molinero O², De Paz JA¹, Márquez S², González-Gallego J¹

¹Department of Biomedical Sciences. ²Department of Physical Education, University of León, Spain.

In an entire season, the training loads are modified in order to achieve a biological and psychological adaptation that permits to reach, among other effects, successful performance. However, when intense microcycles of effort, which impose concentrated workloads while allowing little time for rest are undertaken, fatigue and overtraining may develop. In team sport seasons, as is the case of handball, in which there is at least a competition per week, it is difficult to quantify training loads in a continued monitoring. Our aim was identify biochemical and psychological changes that occurs in handball players along an entire season as potential markers of fatigue and overtraining.

14 handball players (20.2 \pm 2.8 years) of First League National Division, were evaluated in 5 different moments of the season, coinciding with different periods of training load. A blood extraction was made on five occasions in antecubital vein during basal conditions. Apart from proper variables of typical haemogram,

different indicators of damage, such as creatin-kinase activity, oxidized (GSSG) and reduced glutathione (GSH) and C-reactive protein (CRP) were measured. Prior to blood extraction, each player completed the Recovery-Stress Questionnaire for Athletes (REST-Q) and the Profile of Mood Status (POMS) questionnaire.

Red blood cell count and hematocrit increased along the season ($p < 0.05$), the highest values being reached at the end of the aforementioned season. GSSG was significantly increased and GSH/GSSG ratio were reduced in parallel ($p < 0.05$) until the moment of maximal training load. These changes were parallel to a lymphocyte count reduction. CRP also increased significantly according to the training load ($p < 0.01$). Modifications reported tended to normalise at the end of the season. The total mood state POMS scale and the total stress score and total recovery scores from the REST-Q did not change significantly during season. The absence of changes in the measured psychological variables suggest that overtraining did not occur, although the various alterations in haematological and biochemical parameters indicate the existence of oxidative/inflammatory effects according to training load during season.

Financiado por la Acción Estratégica sobre el Deporte, Plan Nacional I+D+i; con la colaboración de la Fundación Club Balonmano ADEMAR León.

Key words: Training load. Inflammation. Questionnaires.

Heart rate variability analysis in the Spanish field hockey team: from 2006th World Cup to pre-Olympic preparation

Capdevila L¹, Cervantes J¹, Florit D², Parrado E¹, Yanguas X³, Rodas G²

¹Autonomous University of Barcelona. ²Medical Services, Futbol Club Barcelona. ³Medical Services, Spanish field hockey team.

In sports medicine, heart rate variability (HRV) is generally used to assess adaptation to endurance training. Our purpose was to study the follow-up of the training adaptability to the loads for hockey players during two top-level international competitions, analysing changes in HRV. The study involved 7 hockey players of the Spanish national team during the 2006th World Cup Jockey and during a preparatory period for Beijing Olympic Games (2008) (age 24.7 \pm 4.6). The players agreed to HRV analysis being done before several international matches and trainings. HRV was analyzed with time domain (RMSSD and PNN50) and spectral domain (HF, LF and LF / HF) methods from RR intervals, recorded for each session during 5 minutes in stable supine resting (OmegaWave System). At the 2006th World Cup hockey 7 matches were studied, and the results show that RMSSD, PNN50 and HF decrease progressively throughout the tournament (MANOVA, $p < 0.05$). LF and LF / HF show a progressive increase ($p < 0.05$). Comparing a match of the World Cup (2006) with a training session of the pre-Olympic preparation (2008), players have positive correlations for the parameters RMSSD ($\rho = 0.829$, $p = 0.042$) and LF ($\rho = 0.943$; $p = 0.005$). According to the Wilcoxon Test, the values for the players in the World Cup for RMSSD, PNN50 and HF ($p < 0.05$) were lower, and for LF / HF ($p < 0.05$) were higher than in the pre-Olympic preparation. These data suggest that in a competition with many matches (World Cup), HRV and parasympathetic activity have a gradually decrement and, at the same time, sympathetic activity increases, indicating a disruption in the loads adaptation and an increase in the fatigue level. After two years, the positive correlations suggest that the analysis of HRV shows consistent results in the pre-Olympic preparation. As they are training sessions, there is a better adaptation to the loads and a lower fatigue level. HRV analysis is a promising tool that may expand in the follow-up of elite athletes. It can be a good individual marker of the cardiovascular adaptability to the effort. It can help manage resting time and prevent overtraining in the competitions high performance is required during long-term periods.

(Supported by DEP2006-56125-C03-01 grant from "Consejo Superior de Deportes", PS12008-06417-C03-01/PSIC grant from "Ministerio de Ciencia e Innovación", and SGR2005-00318 grant from "Generalitat de Catalunya")

Key words: Heart rate variability. Overload marker. Hockey.

Analysis of the correlation between laboratory results and flatwater test reached by Spanish elite paddlers

García-Soidán JL¹, García Soidán P⁴, Huelín Trillo F^{2,3}, García Allegue C³, Barcala Furelos R¹

¹Universidade de Vigo; ²Centro Galego de Tecnificación Deportiva de Pontevedra; ³Federación Española de Piragüismo; ⁴Universidade de Vigo

Table 1. García-Soidán JL, et al. Total correlations obtained between each independent variable and time variable

Variables	Correlation with time
VO ₂ med	0.951
FCmax	0.610
P	0.364
LACTmax	0.169
Wmed	-0.089

Table 2. García-Soidán JL, et al. Coefficients of multiple linear model at different stages

Model	Non-stand. Coeff.	Stand. Coeff.		t	Sig.	
		B	Typ. error			Beta
1	(Constant)	-0.237	0.424		-0.559	0.606
	VO ₂ med	0.008	0.001	0.951	6.148	0.004
2	(Constant)	-0.757	0.222		-3.417	0.042
	VO ₂ med	0.009	0.001	1.066	14.682	0.001
	Wmed	0.037	0.009	0.309	4.252	0.024

p <0.05

Introduction: The aim of this work was to determine the relationship existing between the lab-measured variables and flatwater test results in elite paddlers. With this purpose, a research was carried out with the participation of six top paddlers belonging to the national team.

Material and methods: In two time periods, kayakergometer tests and other lab analysis were applied to these athletes, and besides, with a margin of 15 days of difference each time, flatwater tests, in a 1000m lane, were carried out.

Results and conclusions: In order to make an initial evaluation of the relationship between lab-measured variables and course times, we obtained the total correlations or those data presenting a value of regarding time variable.

The main conclusions of this study can be summed up into two ideas: the identification of a set of independent variables which significantly explains the variability in times reached by paddlers: the average VO₂ and the average W. On the other hand, the possibility to establish a valid adjustment, in this case a linear one, which makes possible to quantify the related rates among significant variables, as well as how to foresee future time results of athletes having into account present lab and flatwater test data: VR Foreseen Time = -0.757 + 0,009* VR VO₂med + 0,037 * VR Wmed.

Acknowledgement: This work has been supported by grant from Consejo Superior de Deportes of Spain (17/UPB10/07).

Key words: Canoeing. Tests. Kayakergometer.

Normative data to classify the physical condition of cyclist according to the maximal oxygen consumption (VO₂max)

Galilea PA, Pons V, Riera J, Drobnic F

CAR, Departamento de Fisiología, Sant Cugat del Vallés

Objective: In order to evaluate adequately the physical conditioning of athletes, we need to know the distribution of the VO₂max in the population of study. Habitually, we use the normative data published by The Cooper Institute to evaluate this variable in the general population. However little is known what this distribution is in specialized populations. We present a scale to evaluate the physical conditioning of male cyclist relative to his VO₂max.

Methods: 284 male cyclists underwent a graded exercise test to determine the VO₂max and the loads corresponding to the maximum level of exertion and four fixed blood lactate levels. The test consisted of 4 minutes stages of work at different levels of exertion, beginning at 100 w and progressively adding 30 w to the workload. All cyclists were international level, and compete in different age categories (Cadete: 15-16 years, Junior: 17-18, Sub 23: 19-22; Elite: 23-29 years, Master-30: 30-39 years; Veteran: equal or more than 40 years). In order to establish a useful standard, the cyclists were classified relative to his competitive age.

Table 1. Galilea PA, et al. Data of two categories. U4 are de watts per kilogram at the level of 4 mM/ml lactate.

	VO ₂ max/kg	U ₄ /kg	Umax/kg	BMI
Sub 23				
Percentil 25	62.5	4.3	5.2	20.5
Percentil 50	66.7	4.7	5.6	21.2
Percentil 75	72.2	5.3	6.0	22.2
Percentil 95	79.5	5.7	6.5	23.9
Élite				
Percentil 25	58.7	4.4	5.2	21.6
Percentil 50	66.8	4.9	5.5	22.5
Percentil 75	70.6	5.2	6.0	23.6
Percentil 95	78.2	5.7	6.4	25.7

Results: What is evident from these data is that the VO₂max maximizes to the sub-23 category, and is difficult to sustain it, unless a high level of competition is reached.

On the other hand, the load per weight tends to maximize during the elite category.

Although these are all competitive cyclists, the BMI shows a clear gain with age.

The yo-yo intermittent recovery test and its relation to the specific position in young soccer players

Losada JA^{1,3}, Fernández E^{2,3}, Mora J¹

¹Universidad de Cádiz; ²Centro Andaluz de Medicina del Deporte. ³Departamento de Planificación, Investigación y Desarrollo. Cádiz CF.

Introduction: One of the conditions in the contemporary training is the cumulative assessment of the training process with the help of a suitable test. The endurance of the soccer in competition (creating intermittent driving sequences repeated in time with a high intensity load) requires aerobic and anaerobic metabolic processes, and in turn, are related to the specific position to play within the system of play. The assessment of this specific endurance of the soccer players, can be done through various tests, offering us the Yo-Yo Intermittent Recovery Test Level 1 (YYIRT1) as a valid tool for assessing the quality. The objective of this research was to relate the results obtained on YYIRT1 in with the specific role played by every young player in the field of play.

Material and methods: 16 young soccer players competing in the Division 1 and belonging to the Andalusian Cadet Cádiz CF S.A.D. (15 ± 0.7 years, 66.22 ± 10.43 kg, 173.81 ± 6.82 cm) participated in this study on a voluntary and consensual, like the coaching staff. The test was done in the second period competitive within a mesocycle of conduct and specifically in a microcycle adjustment.

Results: The results show significant data in terms of distance covered in the YYIRT1 (1987.5 ± 355.59 m.) and its relation to the role play, and the estimated maximum oxygen consumption (53.09 ± 2,98 ml / kg / min).

Conclusion: We can deduce that the YYIRT1 is a valid and useful tool for assessing the aerobic condition of young players, because of its intermittent nature, which in turn is related to the specific activities of the game.

Key words: Soccer. Field test. Maximum oxygen consumption.

TRAINING AND PERFORMANCE IMPROVEMENT I LANGUAGE: ENGLISH

A prospective observational study of hydration status in elite female soccer players by urinalysis assessment

Boyce Stephen H, Quigley Michael A

Wishaw General Hospital, Wishaw, Scotland and Scottish Football Association

ORAL COMMUNICATIONS

Introduction: The Scotland women "A" national football squad were in Cyprus for 10 days competing in a tournament. This involved playing five competitive games in a warm environment with average daily temperatures greater than 20 degrees celsius.

Aim: To determine the hydration status of a group of elite female soccer players during a competitive tournament by urinalysis assessment before and after an educational session on hydration.

Method: Ten players were randomly selected for urinalysis assessment. These were the starting outfield players from the team for the second match, chosen by the coach based upon football tactics. No players had any prior knowledge of the study. Each player provided a morning urine sample for seven consecutive days. The urine was examined and the colour of the sample compared to standard urine hydration colour charts and assigned a value (1 – 8) reflecting hydration status. A value of 1-3 indicated the target hydration state, 4 and 5 highlighted dehydration and 6-8 severe dehydration. The amount of minutes each player participated in each competitive match was noted. The first match was played two days before the study began. The other games took place on Days 1, 2, 4 and 6. Oral fluid intake was not monitored.

Following the initial study an educational session on hydration and performance for the entire squad took place. All squad players were then randomly tested for hydration status three months later at a competitive fixture.

Results: Only three players were consistently hydrated throughout the tournament (Players 6,7 and 9). Player 4 was injured in the second match and played no further part in the tournament. The following table indicates the urinalysis values and total minutes of competitive football played during the tournament. There is no direct correlation between the number of competitive minutes played and the level of hydration. Three months later following the educational session all players were adequately hydrated based on urinalysis assessment prior to a competitive match.

Conclusion: The majority of the players were consistently not fully hydrated during the tournament. Dehydration leads to poorer performance. A programme of education highlighting dehydration and rehydration issues for the national squad was implemented and led to an improvement in the hydration status of the players. The role of education in elite athletes is crucial to improving sporting performance.

Key words: Hydration. Dehydration. Urinalysis.

Table 1. Boyce Stephen H, et al.

Day	1	2	3	4	5	6	7	Total mins. played
Player 1	4	3	4	3	3	2	1	405
Player 2	1	2	5	5	4	2	4	209
Player 3	4	2	4	4	4	3	3	338
Player 4	1	3	3	2	2	2	3	166
Player 5	3	3	4	4	4	1	2	405
Player 6	1	1	1	1	2	1	2	292
Player 7	2	1	1	2	1	1	1	405
Player 8	4	4	4	4	3	4	4	279
Player 9	4	1	2	1	1	1	1	200
Player 10	4	5	4	5	3	4	2	244

Effect of unilateral breathing on coordination and force symmetry in crawl swimmers

Chollet Didier, Tourny Chollet Claire, Seifert Ludovic

CETAPS EA 3832, Faculty of Sport Sciences, University of Rouen

Studies comparing different breathing modes have suggested that asymmetrical arm coordination occurs in the front crawl. Breathing causes a lateral movement, disturbing body alignment, as well as the continuity of propulsive actions and the kinematics of the hand path through the water. Moreover, a preferred side to breathe is also noted during the front crawl. Asymmetry may thus be a true coordination mode and not just a functional error. Training volume and its intensification to develop high swimming expertise have an impact on the swimmer's musculoskeletal adaptations. The demand placed on the shoulder's medial rotator muscles is very high during the propulsive phase of the stroke cycle. The high repetition of arm swimming movements could thus cause hyper-development of the medial rotator muscles.

The aim of this study was to identify the relationship between breathing laterality and motor coordination symmetry as a function of the symmetry of medial rotator muscle force in the shoulders. The principal objective was to distinguish swimmer profiles. Thirteen expert male swimmers performed the front crawl and were assessed for: (i) inter-arm coordination with the Index of Coordination and arm coordination symmetry with the Symmetry Index, (ii) breathing laterality, and (iii) the symmetry of the isokinetic force in the shoulder medial rotators. The results indicated two profiles: (i) swimmers for whom breathing laterality was related to force symmetry and stroke phase duration and (ii) swimmers for whom the impact of breathing laterality on force symmetry and stroke duration was low. The first profile corresponded to sprint specialists and the second profile corresponded more to middle-distance specialists. The risk of injury to the shoulder seemed higher in the sprint specialists. To prevent rotator cuff injury and impingement syndrome, bilateral breathing or frontal snorkel using could be recommended for sub maximal speeds, especially during training.

Flowaid FA-100, a new physiologic electro-muscular stimulator that mimics the action of the native calf musculature

Tamir Jeremy

Halstead Hospital, Kansas, USA

Background: The lower limb muscle pump is essential for normal venous return and arterial blood flow. Failure of this pump mechanism due to decreased mobility can easily lead to venous insufficiency, oedema, pain, muscle atrophy and subsequent arterial insufficiency. Flowaid FA-100 is an external, portable, neuro-stimulator that activate the calf muscles, producing a peristaltic wave that mimics the natural muscle pump.

Goal: To present the effects of Flowaid FA-100, an external musculo-stimulator device on venous and arterial lower limb blood flow.

Methods: Measurements were taken before and during activation of the Flowaid FA-100 device on the lower limbs of healthy individuals. Venous blood flow was assessed with US-doppler of the popliteal vein. Arterial blood flow was assessed with laser doppler skin perfusion pressure (SPP), thermal imaging of the foot and trans-cutaneous PO₂.

Results: 26 legs measurements showed an average of 317% increase in the velocity of venous blood flow. 10 other patients showed 30% increase in SPP. Toe TCPO₂ increased by 50% and the toe temperature raised by 2-3° C.

Conclusion: Flowaid FA-100 is a new technology with a potent ability to enhance venous return and stimulate arterial blood flow by using the native musculature - vascular systems. It may be beneficial in conserving the calf muscle mass of debilitated athletes.

Variability of power output occurring throughout the cycling stage of an elite triathlon

Bernard T¹, Hausswirth C², Le Meur Y^{1,2}, Bignet F³, Brisswalter J¹

¹University of Toulon-Var, Sport Economy and performance lab, FRANCE; ²INSEP, Research Mission, lab of physiology and Biomechanics, Paris, FRANCE; ³French Federation of Triathlon, Saint-denis-la-plaine, FRANCE

Purpose: The aim of this study was to evaluate the power output (PO) during the cycle phase of the Beijing World Cup test event of the future Olympic triathlon in China 2008.

Methods: Ten elite triathletes (5 females, 5 males) performed two laboratory tests: an incremental cycling test during which PO, heart rate (HR), at ventilatory thresholds (VT1, VT2), maximal aerobic power (MAP) were assessed, and an all-out test to record maximal power output (PmaxA). During the cycle part of competition, PO and HR were measured directly. The amount of time spent below PO at VT1 (zone 1), between PO at VT1 and VT2 (zone 2), between PO at VT2 and MAP (zone 3) and above MAP (zone 4) was analyzed.

Results: A significant decrease in average in PO, speed and HR values was observed among periods during the cycle phase. The distribution of time spent at different intensities was 51 ± 9 % for zone 1, 17 ± 6 % for zone 2, 15 ± 3 % for zone 3 and 17 ± 6 % was performed at workloads higher than MAP obtained during maximal cycling test (zone 4). From HR values, the triathletes spent 27 ± 12 % in zone 1, 26 ± 8 % in zone 2 and 48 ± 14 % above VT2.

Conclusion: This study indicates that Olympic Distance triathlon requires a higher aerobic and anaerobic involvement than constant workload cycling exercise classically analyzed in laboratory settings or Ironman triathlons. Furthermore

monitoring direct PO could be more suitable to quantify the intensity of a race with pacing strategies than classical HR measurements.

Key words: Pacing strategies. Competition analysis. Elite triathletes.

Modeling the relationship between infection risk and heart rate variability in elite swimmers

Hellard P¹, Guimaraes F^{2,3}, Avalos M^{2,4}, Barthelemy JC⁵

¹Research department, French Swimming Federation, France; ²Epidemiology and Biostatistics Research Center INSERM U897, Bordeaux, France; ³National Institute of Applied Sciences, Toulouse, France; ⁴University of Bordeaux 2, France; ⁵Department of Clinical Physiology and Exercise, University Jean Monnet, Saint-Etienne, France.

Introduction: Elite athletes are exposed to an intense physical and mental stress, caused by competition and intensive training (Gleeson *et al.*, 2007). Effects on immune system might manifest by infections of any type, in particular, muscular diseases and upper respiratory tract infections, which might seriously compromise their training or competitive performance. The immune and nervous systems being connected via the stress neuroendocrine-axis, repercussions on heart rate variability (HRV) are also expected. The objective of this study was to model the relationship between infection risk, physical exercise and HRV in elite swimmers.

Methods: This study reports a 4-season longitudinal follow-up of 28 elite swimmers. For each swimmer, infections were weekly reported by medical personnel. HRV test lasted 15 min: 8 min in supine position (SU), 2 min in supine position with control breathing, and 5 min in standing position (ST). Fast Fourier transform was applied to calculate the spectral power. Logistic mixed model methodology was chosen for the analyses because it is able to model binary outcomes with unbalanced data, account for inter-individual variability and adjust for repeated measures. Models related the infection risk to HRV.

Results: The main results are: 1/ The influence of athletes' levels was highlighted, revealing that risk infection was lower for international compared with national athletes; 2/ A decrease in parasympathetic control in ST increased the risk of infection one week later, during winter; 3/ Muscular diseases were linked to a shift of the autonomic balance in SU toward a decrease in parasympathetic control and an increased in sympathetic drive, during winter.

Conclusion: Our results allow for a better understanding of the effect of intensive training on the risk of illness and its association with HRV. Future perspectives for training strategies are proposed.

References:

Gleeson M, *et al.* Immune function in sport and exercise. *JAP* 2007.

Key words: Fatigue. Immunity. Training. HRV.

TRAINING AND PERFORMANCE IMPROVEMENT-II

LANGUAGE: ENGLISH

Ontogenic of reaction times in children and younger adults in high altitude population

Ferst N^{1,2,3}, Navarro M³, Bolicenha E¹, Ranvaud R³

¹Faculdade Dom Bosco. ²Faculdades Integradas Unibrasil. ³USP Universidade de São Paulo.

Studies show age-related differences in reaction time (RT) between children and adults on simple executive control tasks in sea level altitude. Few studies the RT in different levels, more complex tasks. There's no studies about RT in living high altitude populations. It's well known that ambient factors can influence in prenatal development. Studies show a high prevalence of preeclampsia in women living in high altitude (*Hum Biol* 1999;71(4):553-82). Hypoxia exposure is closely related a placental alteration that can influence in prenatal development. But there's no studies about the ontogenic development of RT in high altitude population. Divided in <14 and >14-22 years-old, 25 children and 15 younger adults birthplace in Paipa, Colômbia, 3200 m above sea level, realize 3 RT tests: RT Simple (RTSMP), RT Choice (RTCHO) and RT Gonogo (RTGNG). The RTSMP is less complex, only one stimuli is presented and the volunteer must press a joystick Button. In the RTCHO volunteers must press the A button when a circle appears and B when is a square. In RTGNG task is press a Button when a

circle appears and don't press when a square appears. A linear regression analysis shows, in the 3 tests, a RT decreasing as a aging function like happens in sea level populations (*Aging, neuropsychology and cognition*, 2007;14(4):417-39). Seven years-old until 14 the RT decrease accentually, after 14 years-old we observe a performance saturation. For children and adults the results of the 3 test was the same values for sea level populations (*Experimental brain research*, 2006;169(1):122-5). The present study found that until the 15 years-old the children not reach adults performance in RT tasks simple or more complex. And there's no difference in between sea level and high altitude population.

Key words: Reaction time. Child. Motor control. High altitude.

Influence of prolonged rowing exercise on plasma visfatin, ghrelin and leptin concentrations in male rowers

Jürimäe J¹, Rämson R¹, Mäestu J¹, Purge P¹, Jürimäe T¹, Arciero PJ², von Duvillard SP³

¹Institute of Sport Pedagogy and Coaching Sciences, Center of Behavioral and Health Sciences, University of Tartu, Tartu, Estonia. ²Department of Exercise Science, Skidmore College, New York, USA. ³Human Performance Laboratory, Departments of Health and Human Performance, Texas A&M University-Commerce, Texas, USA

The aim of this investigation was to measure plasma visfatin, ghrelin and leptin responses to a single endurance rowing training session in male competitive single scull rowers. Nine national level male rowers (20.1±1.5 yrs; 183.9±4.3 cm; 81.0±5.0 kg; body fat% 10.8±3.3%) completed two trials (exercise or control) on separate days. The exercise consisted of a prolonged rowing training session lasting about 2 h (distance: 20.7±1.4 km, heart rate: 133±4 bpm, intensity: 80.2±1.6% of the heart rate turn point) followed by 30 min rest. Venous blood samples were collected pre and post on-water rowing. The control trial consisted of rest and blood collection similarly to exercise trial. No differences were found at baseline values for plasma visfatin, ghrelin and leptin for both trials. The estimated energy expenditure of the exercise trial was 1200-1500 Kcal. Plasma visfatin (-10.0%; P<0.05) and leptin (-20.0%; P<0.05) were reduced and ghrelin increased (+12.2%; P<0.05) at the 30-min post-exercise. No differences in plasma visfatin, ghrelin or leptin over time were observed during control trial. There was no relationship between basal visfatin and body composition, energy balance, aerobic power, or blood biochemical data. Plasma visfatin (r=-0.76) and ghrelin (r=0.75) measured immediately after the training session were related (P<0.05) to the distance covered and no relation was observed for post-exercise leptin (r=-0.16; P>0.05). In conclusion, acute negative energy balance induced by a single endurance rowing training session elicited an inverse metabolic response in visfatin and ghrelin in competitive male rowers. Our results suggest that peripheral markers of negative energy balance, such as visfatin and ghrelin, may be regarded as signals for metabolic reaction to the energy cost of acute exercise. In addition, an energetic deficit threshold must seemingly be met for such a response to occur.

Key words: Blood biomarkers. Endurance exercise. Athletes.

Effects of plyometric training and resistance training in adolescents basketball players

Vila Dos Santos F^{1,2,3}, Bassan Jc¹, Szkudlarek AC¹, Zapani AKM², Camilo E², Souza RF², Santos JAH³

¹Laboratório de Bioquímica e Fisiologia Aplicada ao Movimento Humano. Faculdade Dom Bosco. Curitiba. PR. Brasil. ²Seção de Educação Física. Colégio Militar de Curitiba; ³Laboratório do Exercício. Círculo Militar do Paraná.

The requirement of force in inferior members has showed to be an available and representative element for the increases of performance in basketball athletes with the objective to seek improvements in the motion speed and jumps. The aim of this study was to examine in 16 teenagers male basketball players (mean age 16) the most efficient methodology to gain explosive power and strength (plyometric or resistance training) to improve vertical jump (VJ), horizontal jump (HJ) and the speed racing (V) performances. This research was approved by the Human research Ethics Committee of Dom Bosco's College. The subjects were divided in 2 groups. The plyometric group (PG) made plyometrics exercises two times a week, forty five minutes each for three months. The athletes made seven-

ral types of progressive plyometric jumps. The Resistance Force Group (RFG) trained resistance two times a week, fifty minutes each for three months using muscle equipments and free weights (3 series of 15 to 20 repetitions each, loads 0.60 to 70% of 1RM test). The muscle groups worked were quadriceps, hamstring and gastrocnemius. To verify the efficacy of the applied methodologies were made the long jump test, the sergeant test and the 30 meters test. The training and the testing procedures were tolerated by the subjects. The results showed that the plyometric training brought significant increases in the HJ performance (first -test: $195 \pm 0,18$ cm and last-test: $218 \pm 0,14$ cm ; $p < 0,05$) and in the VJ performance (first -test: $45,75 \pm 6,11$ cm and last-test: $51,50 \pm 6,74$ cm; $p < 0,05$). However, no significant improvement was found in the V performance provided by plyometric training (first -test: 4.76 ± 0.15 sec and last-test: 4.72 ± 0.18 sec). The RFG did not show significant improvements in any of the variables. Besides, it was observed that the RFG had a significant decrease in the V test performance (first -test: 4.55 ± 0.26 sec and last-test: 4.82 ± 0.36 sec; $p < 0,05$). These results suggest that improving strength and explosive force to increase the HJ and VJ performance should be performed by plyometric exercises because they are specific to basketball game movements. We speculate that the resistance training should be worked with other forms of training like jumps and velocity exercises.

Key words: Basketball. Plyometric training. Resistance training.

Change in performance, but not in oxygen cost of running, during cycling-running succession

Díaz V¹, Alvarez M¹, Peinado AB¹, Benito PJ¹, Zapico AG², Calderon FJ¹

¹Facultad de Ciencias de la Actividad Física y del Deporte – INEF, Universidad Politécnica de Madrid. ²Facultad de Educación, Universidad Complutense de Madrid.

Aim: The aim of this study was to evaluate changes in performance and oxygen cost of running (OC) in well trained triathletes after one season.

Material and methods: Six professional male triathletes (PRO) and nine elite male young triathletes (YOU), selected by the Spanish Triathlon Federation as the best in their category (under 16), participated in the study.

Experimental protocol consisted of two trials performed in the same moment of two consecutive seasons. In trial 1 subjects completed an incremental test on a cyclogometer to assess the ventilatory threshold¹. Trial 2 consisted of 30 min cycling on a cyclogometer at a load corresponding with the ventilatory threshold determined in trial 1. Immediately after, subjects run 3000 m as fast as possible on a 400 m track (7,5 laps). All cardiorespiratory variables were measured with a portable metabolic system and OC was calculated each 400m using the formula of di Prampero².

A two way ANOVA (season x lap) with repeated measures was used to evaluate the main effects and changes in speed, OC and cardiorespiratory variables between seasons lap by lap. Significance level was fixed at $p < 0.05$.

Results: An increase in $\dot{V}O_2$ (9,9% from season 1 to season 2) was observed in YOU group in the second season compared with the first (4227 ± 512 vs. 4649 ± 623 ml \cdot min⁻¹, $p < 0.05$). Also, the speed increased (5,5%) in this group after one season (16.4 ± 0.6 vs. 17.3 ± 0.7 km \cdot h⁻¹). When comparing seasons lap by lap, differences were observed for the speed of running between the 1st and 5th lap in YOU group, but no differences were showed for OC. In PRO group, neither speed nor OC presented differences when comparing seasons lap by lap or the main effects.

Discussion and conclusion: Since, OC is the relationship between $\dot{V}O_2$ and speed, it was surprising to observe that different changes in these variables did not affect the OC in the YOU group. Moreover, differences were only observed in the first part of the running sector. Then, in agreement with others studies^{3,4}, we speculate that there is a metabolic rate (in our case expressed as ml O_2 \cdot min⁻¹ \cdot km⁻¹) that is fixed in a feedforward manner in order to prevent peripheral fatigue, although others factors such as mechanical efficiency should be considered.

On the other hand, there were no changes in the PRO group. First of all, a low statistical power could be related with the absence of differences. Moreover, these triathletes could be experimenting an "steady-state" in their performance⁵. In conclusion, metabolic factors per se can not explain the improvement on performance, defined here as the speed, during cycling-running succession.

References:

1. Beaver WL, et al. *J Appl Physiol* 1986;60:2020-7.
2. di Prampero PE. *Int J Sports Med* 1986;7:55-72.
3. Amann N, Dempsey JA. *J Appl Physiol* 2008;586:161-73.
4. St Clair Gibson A, et al. *Sports Med* 2006;36:705-22.
5. Londree BR. *Med Sci Sports Exerc* 1997;29:837-43.

Could the mean point of the ventilatory thresholds be the maximal lactate steady state?

Peinado AB¹, Díaz V¹, Benito PJ¹, Álvarez M¹, Zapico AG², Calderón FJ¹

¹Facultad de Ciencias de la Actividad Física y del Deporte – INEF Madrid. Universidad Politécnica de Madrid. ²Facultad de Educación. Universidad Complutense de Madrid.

Introduction: The maximal lactate steady state (MLSS) has been studied along years as the point where the lactate concentration is maintained stable during prolonged submaximal constant workload¹. Nowadays, the valid test to determine MLSS implies to carry out several constant load tests, although several authors have tried to validate other news single-day protocols with different results²⁻⁴. The aim of the present study was to verify if the mean point (MP) of the ventilatory thresholds (VT), obtained with an incremental test, corresponds with the MLSS.

Material and methods: Twelve amateur cyclists participated in the study (21 ± 2.6 years; 179.8 ± 7.5 cm; 72.2 ± 9 Kg). Each subject performed an incremental test (25 W \cdot min⁻¹) until exhaustion on cicloergometer, and two constant load tests of 30 minutes to determine MLSS, at an intensity around the MP of VT. The steady state tests were performed on a road bicycle fitted with a Schoberer Rad Messtechnik (SRM) powermeter. The expired air was analyzed with a gas analyzer Jaeger Oxicon Pro. Arterialized venous blood samples were obtained at 0, 10, 20 and 30 minutes during the steady state tests. MLSS was defined as the highest workload that can be maintained with an increase in lactate concentration [La⁻] lower than 1.0 mmol \cdot L⁻¹ during the final 20 min of the constant load tests⁵⁻⁵. A one way ANOVA was used to compare the physiological response at the different instants of the incremental test (VT₁, MP, VT₂, RER=1.00 and MAX) and MLSS. Using MLSS determination as the reference method, the validity of the other five instants were assessed using the Bland-Altman method⁶. The significant level was set at $\alpha < 0.05$.

Results: There were no significant differences between VT1 and MP with MLSS in workload variables (W, W \cdot kg⁻¹ and %W_{max}), but the MP seems to be the closest point to MLSS (see figure beside). Neither there were significant differences between MP, VT₂ and RER=1.00 with MLSS in oxygen uptake variables ($\dot{V}O_2$, $\dot{V}O_2$ \cdot kg⁻¹ and % $\dot{V}O_{2max}$), being MP the nearest point to MLSS again.

Conclusions: The main finding of the present study is that the MP of VT is the closest point to MLSS. Since the mean difference and bias are 27.5 ± 15 W, the workload corresponding to MP allows an approximated estimation of MLSS (Figure 1).

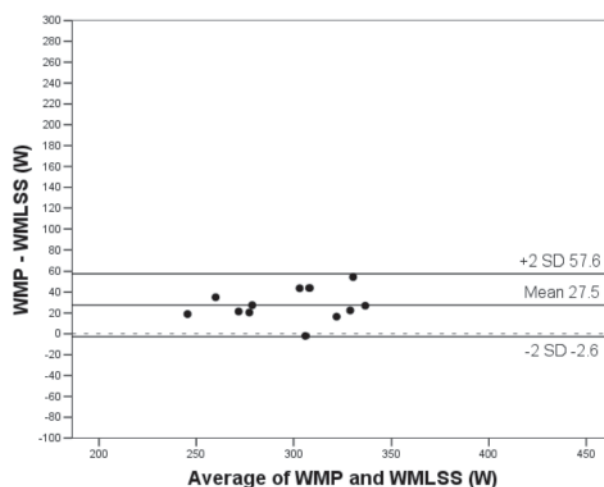


Figure 1. Peinado AB, et al.

References:

1. Beneke R. *Eur J Appl Physiol* 2003;89:95-9.
2. Kilding AE, Jones AM. *Med Sci Sports Exerc* 2005;37:1734-40.
3. Kuphal KE, et al. *J Sports Med Phys Fitness* 2004;44:132-40.
4. Laplaud D, et al. *Eur J Appl Physiol* 2006;96:446-52.
5. Baron B, et al. *Br J Sports Med* 2007;18.
6. Bland JM, Altman DG. *Lancet* 1986;1:307-10.

Key words: Constant load tests. Workload. Lactate.

TRAINING AND PERFORMANCE IMPROVEMENT-III

LANGUAGE: ENGLISH

Improvements in thermoregulation in adverse environmental conditions using a new cooling vest

Vaz Pardal C^{1,2}, Ruiz Verdeja C¹

¹Centro Andaluz de Medicina del Deporte, San Fernando, Cádiz.

²Real Federación Española de Vela.

Introduction: In Qingdao, the sailing venue during the 2008 Olympic Games, it was difficult to control thermal stress after physical exercise due to the extreme environmental conditions. Some of the physiological mechanisms to reduce core temperature such as radiation, convection or conduction become inefficient at air temperatures over 30 degrees Celsius. The heat produced during exercise can only be dissipated by sweat evaporation, but in Qingdao, due to the elevated relative humidity (>80%), this mechanism become less efficient with a negative impact on sailors' performance.

Material and methods: The Spanish Olympic sailors acquired a new model of cooling vest (Cryovest®) to face the climatic conditions by reducing the core temperature. Radiotelemeter temperature sensors were used, together with an infrared camera in order to verify the effectiveness of this vest.

Results: This vest was found to offer the following advantages with respect to existing ones:

- Lower reduction of the skin temperature in contact with the vest
- More pleasant sensation for the sailor: the temperature of the skin in contact with the vest remains at a stable temperature (15-17°C), for more than 100 minutes measured using an infrared camera, compared to the drastic temperature reduction in the case of other vests, nearly 5°C (Figures 1 and 2).
- Longer duration of the effects: The outside surface of the vest has three insulating tissues (teflon, aluminum and a thermal insulator) that prolong the duration of its cooling properties for more than two hours, as opposed to the 30 minutes of other vests.
- More effective reduction of the core temperature, never exceeding 39,8 degrees Celsius (Figure 3).

Conclusions: The french vest at the moment offers advantages with respect to the use of other existing cooling vests. The Spanish Sailing Olympic Team was therefore able to better adapt to the climatic conditions during the Olympic Games.

Key words: Sailing. Cooling vest. Environmental conditions.

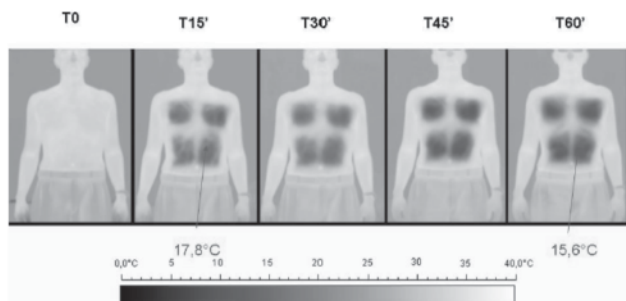


Figure 1. Vaz Pardal C, et al.

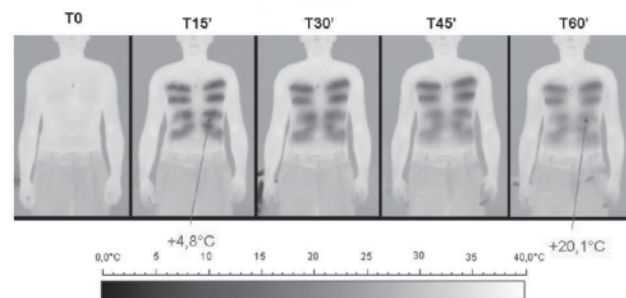


Figure 2. Vaz Pardal C, et al.

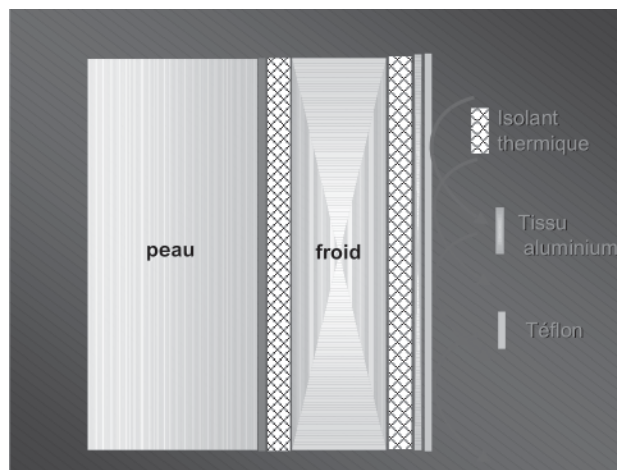


Figure 3. Vaz Pardal C, et al.

Eccentric training and repeated bout effect in young women

Fernández-Gonzalo R, Hernández-Murúa JA, De Souza-Teixeira F, Jiménez-Jiménez R, Bresciani G, De Paz JA, González-Gallego J
Institute of Biomedicine, University of León, León, Spain.

Introduction: The eccentric training and the repeated bout effect have been widely studied in the last years, but there is a lack of data about them when the subjects performing the training or the acute bout are women. Therefore, the purpose of this study is to determine the functional response of young women to two eccentric acute exercises separated by 5 weeks and to analyze if eccentric training can influence responses.

Material and methods: 24 active women were recruited and divided in two groups, the training group (TG, n=14, age 22.6±1.2) and the control group (CG, n=10, age 22.1±1.6). Five days before the two acute exercises, the subjects were tested for maximum voluntary isometric contraction (MVIC), range of movement (ROM), 1RM, and peak power (PP). Before and after the training period an acute eccentric test, consisting in 120 eccentric repetitions (10x12) with a load of 70% 1RM, was performed. Immediately, 24, 48 and 168 hours after the acute bouts the subjects were tested for MVIC, ROM and PP. Besides, a visual analogue scale (VAS) for exercise induced muscle pain in quadriceps muscles had to be filled in by the subjects immediately, 6, 24, 48, 72 and 168 hours after the acute bouts. Between the two acute bouts TG followed an eccentric training that consisted in 30 eccentric repetitions (10x3) with loads varying from 45 to 55% of 1RM, 3 times per week, during 4 weeks. All tests and trainings were carried out in the same leg press.

Results: MVIC was higher for the TG after the training period, while 1RM did not change. In the second acute bout the CG lost less MVIC and PP and the recovery of both parameters was better than in the first one, while the TG got similar results for these measurements in both bouts. ROM results were similar among bouts and groups. TG reported less pain during the first 48 hours following the second acute bout compared with the results for the first one, while CG only presented significant less pain between acute bouts in the post-6h moment.

Conclusions: When an acute eccentric exercise is performed for the first time it causes young women muscular damage, losing isometric strength, PP, ROM and increasing the muscular pain. But if that exercise is repeated 5 weeks later the losses of isometric strength and PP are lower, changes known as the repeated bout effect. Furthermore, the eccentric training followed in this study made the women improve their MVIC, but not the 1RM. It gave them no advantage for the second eccentric bout either, but, on the contrary, it made TG have the same MVIC and PP losses than in the first bout, preventing, at least to some extent, the repeated bout effect to appear. On the other side, the eccentric training did decrease the pain the TG suffered after the second bout.

Funded by the Junta de Castilla y León (LE024A07)

Key words: Eccentric. Training. Women.

Coping inventory for competitive sport: convergent and concurrent validity of the Spanish version

Molinero O, Salguero A, Márquez S

Facultad de Ciencias de la Actividad Física y del Deporte. Universidad de León (España)

Introduction: The Coping Inventory for Competitive Sport (CICS) is a questionnaire developed by Gaudreau and Blondin (2002) to identify coping strategies used by the athletes in the competition. Our research group has previously shown the factorial structure and the reliability of the Spanish version of CICS. The purpose of the present study is to take another step in our tool validation, confirming its convergent and concurrent validity.

Material and methods: 45 athletes of different sports and competitive levels, both genders and 14-28 aged completed a battery composed of a socio-demographic questionnaire, CSAI-2 (somatic anxiety, cognitive and self-confidence), PANAS (positive and negative affect), COPE (coping strategies), and CICS (coping strategies). They were administered immediately after a sport competition. The resulting data were treated by means of the statistical package SPSS 15.0 (Chicago, US), a descriptive statistic and Pearson's Correlations with Bonferroni correction were performed. **Results:** The observed correlations between the scales of the Spanish version of the CICS and COPE, are in the range of those described for the original version, which show a relationship between the CICS and the MCOPE. The differences can be justified through the conceptual differences among some of the scales of both instruments. The factor distancing and venting unpleasant emotions in the CICS correlated significantly with the scale of somatic anxiety (CSAI-2), while the factor imagery/effort expenditure correlates with self-confidence in the same questionnaire. The imagery/effort expenditure and seeking support/logical analysis scales of the CICS correlated with the COPE scale of positive affect, while mental distraction/resignation and distancing and venting unpleasant emotions correlate with negative affect, as happened in the original study (Gaudreau & Blondin, 2002).

Conclusions: The Spanish version of the Coping Inventory for Competitive Sport shows concurrent and convergent validity. The questionnaire can be useful to know about coping strategies used by athletes in sport competition, identifying some of the psychological factors which influence on performance, and taking part appropriately.

Financiado por la Junta de Castilla y León en su Programa de Apoyo a Proyectos de Investigación (2005-08).

References:

- Gaudreau P, Blondin JP. Development of a questionnaire for the assessment of coping strategies employed by athletes in competitive sport settings. *Psychology of Sport and Exercise* 2002;3:1-34.

Key words: Coping. Validation. Performance.

Effects of anaerobic training on serum paraoxonase / arylesterase enzyme activities

Turgay F¹, Sisman AR², Cecen Aksu A³, Akalin E⁴

¹Turkish Directorate of Youth and Sports, Sports Health Center, Izmir, Turkey; ²Dokuz Eylul University, Medical Faculty, Biochemistry Department, Izmir, Turkey; ³Sports Medicine Private Practice, Izmir, Turkey; ⁴Dokuz Eylul University, Medical Faculty, Physical Medicine and Rehabilitation Department, Izmir, Turkey.

Introduction: Antioxidant characteristics of high density lipoprotein (HDL) may partly reside on the paraoxonase (PON1) / arylesterase (AE) enzymes it incorporates. Improving effects of aerobic exercise on paraoxonase (PON1) activity and its regulation by PON1-192 polymorphism has documented. The aim of our study is to investigate the effects of anaerobic (judo) training on PON1 / AE activities and its relationship with PON1-192 polymorphism.

Methods: A total of 18 Turkish national female judoists (aged 17.9 ± 0.8 yr) participated in the study. In the 19 week period prior to the competitive season, once at the start and once at the end, serum basal PON1, salt (NaCl) - stimulated PON1 (TSPON1) and AE activities and, PON1 and AE activities in serum HDL and its subfractions (HDL₂ and HDL₃) were analysed with kinetic methods. Total cholesterol (TC), HDL-C, HDL₂-C, HDL₃-C, LDL-C and triglyceride levels were determined in judoists' fasting venous blood samples, their physical characteristics measured and critical speeds were calculated. PON1-192 polymorphism were determined using TSPON1 / AREST ratio. The phenotype groups were classified as QQ and R carriers (QR+RR).

Results: While no significant changes occurred in the players' physical characteristics and critical speed scores following the training period, significant increases were established in HDL-C and HDL₃-C levels, serum basal PON1 and

AE activities, PON1 activities in serum HDL and its subfractions, and AE activity in HDL. When PON1 polymorphism is concerned, in both Q and R carriers serum basal PON1 and HDL-PON1, in Q group HDL₂-PON1, in R carrier group HDL₃-PON1 and HDL₂-AE activities significantly increased. Triglyceride levels of Q group was more than that of R carriers.

Conclusion: Judo training of anaerobic nature may have mediated beneficial effects on HDL-C, PON1 and AE enzyme activities. The differences between the phenotype groups and other group's results can due to PON1-192 polymorphism.

Key words: Judo. Paraoxonase/arylesterase. PON1-192 polymorphism. HDL-C. HDL₂-C. HDL₃-C.

Oxygen consumption during drafting in swimmers

Conceição A¹, Moreira A¹, Silva A², Reis V^{2,3}, Brito J¹, Mendes B²

¹Sport School of Rio Maior, Polytechnic Institute of Santarém, Portugal. ²University of Trás-os-Montes and Alto Douro, Vila Real, Portugal. ³Research Center in Sport, Health and Human Development, Vila Real, Portugal

Introduction: Drafting is the term used in sports physiology and biomechanics to describe the achievement of a more shift and protected position, and can be defined as a technique / strategy in which the competitors are aligned in a group with the aim of reducing the effect of drag force. In this sense, the increasingly common use and successfully effect of the Drafting raised new questions in terms of features and mechanisms that regulate the human displacement in sports such as athletics, cycling, swimming and triathlon. The aim of this study was to evaluate the oxygen consumption during Drafting in swimming using different distances between swimmers and compare this condition with single swimming.

Methods: A group of 7 trained male subjects (63.85 ± 9.33 kg, 173.72 ± 6.87 cm; 15.0 ± 0, 81 years; personal record in the 200 meters freestyle = 133.98 ± 4.76 seconds) were evaluated. The swimmers performed the following protocol: i) swam individually two hundred meters freestyle at a constant speed, ii) swam immediately behind a swimmer (0m), iii) swam 3m behind a swimmer, iv) swam 6m behind a swimmer. Swimming in Drafting was performed at the same speed of the first bout. The VO₂ was measured by a gas analyzer (K4b2, COSMED, and Italy) coupled to a valve (Aquatrain, COSMED, and Italy). In data analysis we perform an "averaging" of 10 seconds for every subject, a "smoothing" of 3 points and performed a further filter of the number of breaths per minute (rpm), setting up the ceiling of 55 rpm.

Results: With regard to the values of oxygen consumption, the differences between the free swim and swim in different situations of Drafting were not significant and only on condition 0 m there was a decrease in VO₂, compared with the single swim. Therefore, our results contradict the current tendency shown in the literature, which seem to indicate a reduction in energy consumption in a state of Drafting.

Conclusions: The hydrodynamic drag coefficient of a swimmer that follows behind increases gradually with the distance between the swimmers but this is not matched by an increased oxygen consumption.

References:

- Pugh LG. The Influence of wind resistance in running and walking and the mechanical efficiency of work against horizontal or vertical forces. *Journal of Physiology* 1971;213, 255-76.
- Kyle CR. Reduction of wind resistance and power output of racing cyclists and runners travelling in groups. *Ergonomics* 1979;22:387-97.
- Chatard JC, Wilson B. Drafting distance in swimming. *Medicine and Science in Sports and Exercise* 2003;35(7Jul):1176-81.
- Hausswirth C, Lehenaff D, Dreano P, Savonen K. Effects of cycling alone or in a sheltered position on subsequent running performance during a triathlon. *Med Sci Sports Exerc* 1999;31(4):599-604.

TRAINING AND PERFORMANCE IMPROVEMENT-IV LANGUAGE: ENGLISH

Classification of available resources to strength training. A review

Gonzalo I, Benito PJ, Calderón J

Facultad de Ciencias de la Actividad Física y el Deporte-INEF Madrid

Introduction: Today there are a multitude of equipment and machines, which can be used for training and rehabilitation. The knowledge of the properties of each of them gives to researcher, coach or sportsman a very useful tool in the design and optimization of their training programs.

Materials and Methods: A depth review or current scientific research¹⁻⁴ allows us to propose our own classification (Table 1).

Conclusions: Any physical activity professional should know the means at its disposal for the training of strength. This knowledge will be able to apply optimal stimuli for each training context, both in terms of the objective and the characteristics of the person who train.

Table 1. Gonzalo I, et al. Classification of available sources to strength training

Name	Class
Gravitational	Bodyweight.
	Vest, ankle and wrist weights.
	Dumbbell, bars and disk.
	Pulleys
	Weight Stack Machines
	Plate loaded machines.
	Machines that allow throwing the load.
Accumulation of kinetic energy	Auto-help and facilitated weight machines.
	YoYo™ Inertial Technology, Versa Pulley™.
Isotonic.	
By deformation of structures constituents.	Band and tubing, CRS™, Spiraflex®.
Gyroscopic	
Isokinetic	Concentric, Concentric-Eccentric
Friction	Friction, Sliding
Resistance to the passage of a fluid	Hydraulic, Resistance to the passage of air
Pneumatic resistance	
Aquatic Resistance	
Aerodynamic resistance	Parachute
Magnetic and Electromagnetic resistances	
Manual resistance	MARES
Neuromuscular Electrical Stimulation	NMES
Whole Body Vibration	Pivotal, Vertical, Transverse
Combinations	Elastic + Free weights, Manual + Plate loaded, NMES + Weight Stack, etc.

References:

1. Harman E. Resistance training modes: a biomechanical perspective. *Strength and Conditioning*. 1994;16(2):59-65.
2. Harman E. The biomechanics of resistance exercise. In: Baechle TE, Earle RW, eds. *Essentials of Strength Training and Conditioning*. Human Kinetics 2000:25-56.
3. Naclerio F. Entrenamiento de la fuerza y prescripción de ejercicio. In: Jiménez A, ed. *Entrenamiento personal Bases, fundamentos y aplicaciones*, INDE 2005:87-133.
4. Tous J. *Nuevas tendencias en fuerza y musculación*. Ergo 1999.

Key words: Strength training. Resistances.

Assessing the status of biological footballer. Impact of training in their skills

De la Cruz Márquez JC¹, García Pérez L¹, Vila Castellar J², García Márquez E¹, De la Cruz Campos JC¹, López García R¹, Cueto Martín B¹

¹Facultad de Ciencias de la Actividad Física y el Deporte de la Universidad de Granada; ²Facultad de Psicología de la Universidad de Granada

Introduction: In the present study was carried out follow-up of a team of amateur football throughout a full season through a series of shots of data with the help of medical devices of varying order. It has analyzed the impact of the training Accumulation, Transformation and Execution (ATR) in the biological capabilities of the players.

Materials and methods: 15 Subjects older than age, components of the football team Vandalia Hazard militant from the category of 1st Andalusian group IV. Electrocardiograph DIMEQ 503. 10 Cardiotacómetros Polar S 610. 10 Tensiómetro OMRON 3M-Intellisense. Tanita TBF-300 scale.

Descriptive longitudinal study with three shots of measurement.

Results:

- Weight and Course Navette: Decreased weight without improving Course Navette.

- Blood pressure: Strong correlation between the tensions Pre-Course Navette.
- Heart rate:
 - The H.R. Averages produced during the Course Navette tend to decrease.
 - The H.R. Max. experiencing a gradual ascent.
 - Correlation between H.R. and the manual obtained by electrocardiography.
- Electrocardiogram:
 - Not be detected pathologies.
 - E.C.G. normal.
 - In 80% the E.C.G. detects specific impact of the training.

Conclusions:

- The ATR model, improving the biological condition of the subjects.
- The standard blood used is not reliable enough for such studies.
- The determination of the FC manual on the part of the individuals showed sufficiently reliable.

Key words: ATR Status biological football.

Analysis of swimming individual anaerobic threshold and stroking parameters in triathlon. A case study

Ribeiro J, Santos I, Figueiredo P, Morais P, Colaço P, Fernandes R
University of Porto, Faculty of Sport, Portugal

Economy of locomotion in swimming, cycling and running is very well related to performance in triathlon. Reporting specifically to the anaerobic threshold, Sleivert and Rowlands (1996) stated that this physiological parameter is determinant to a high level triathlon performance when assessed in the appropriate exercise mode. In this sense, triathletes could make large improvements if they develop the above referred parameters. Additionally, in swimming, the ratio between the general biomechanical parameters, stroke rate (SR) and stroke length (SL), is assumed has a valid indicator of stroke efficiency.

The purpose of this study was to assess the individual anaerobic threshold (IndAnT), as well as to observe the kinetics of the stroking parameters, throughout an intermittent incremental front crawl swimming test.

A triathlete (age: 17 years old; weight: 67 kg and height: 175 cm) of the National Portuguese Junior Team, performed a front crawl intermittent incremental protocol of 6 x 200 m with increments of 0.05 m/s per each stage (30 s rest intervals), being the initial velocity established according to the swimmer individual performance of the moment. Swimming velocity was controlled using a visual pacer (TAR.1.1, GBK-electronics, Portugal) with flashing lights in the bottom of the pool. Capillary blood samples for blood lactate concentration ([La⁻]) analysis were collected from the earlobe at rest, after each stage and at the end of the experimental protocol (Lactate Pro auto-analyser). These [La⁻] allowed assessing IndAnT, which was determined by [La⁻]/v curve modelling method (Machado, et al., 2006). SR was assessed through a chronofrequencemeter and SL was calculated by the ratio between v and SR.

The IndAnT occurred at a velocity of 1.32 m/s, which corresponds to 0.90 mmol.l⁻¹ of [La⁻]. This [La⁻] value seems to be lower than those reported in the literature for swimmers, which are between 1.5 and 4.5 mmol.l⁻¹ (cf. Fernandes, et al., 2005). This difference seems to be explained by the higher aerobic capacity

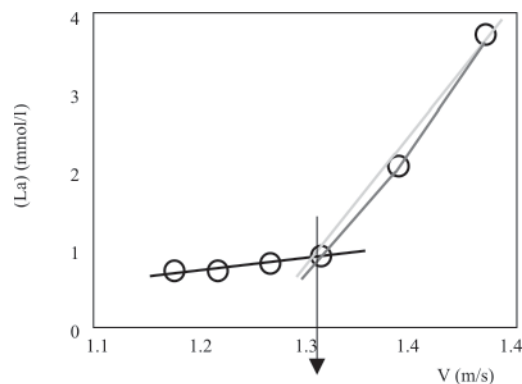


Figure 1. Ribeiro J, et al. Individual [La⁻]/velocity curve

of triathletes induced by mainly aerobic training regimens. This fact limits the use of the traditional $4 \text{ mmol.l}^{-1} [\text{La}^-]$ as a reference value to assess $\text{In}d\text{AnT}$. It was also observed, as expected, a SR increase and a SL decreased during the incremental protocol, as well as a high positive correlation between SR and v ($0.99, p < 0.05$).

We conclude that triathlon has great specificity and that more accurate, specific and individualized testing protocols are needed in order to obtain more precise and objective results helping coaches on their daily training programs.

References:

- Fernandes R, et al. *ECSS* 2005. 266. Belgrade, Serbia.
- Machado L et al. *Port J Sport Sci* 2006;6(2):142-4.
- Sleivert G, Rowlands D. *Sports Med* 1996;22(1):8-18.

Key words: Triathlon. Anaerobic threshold. Stroking parameters.

Correlation of tethered swimming with swimming performance

Morouço P^{1,2,3}, Soares S¹, Vilas-Boas JP^{1,3}, Fernandes R^{1,3}

¹Faculty of Sports, University of Porto, Portugal; ²School of Education, Polytechnic Institute of Leiria, Portugal; ³Portuguese Swimming Federation.

Tethered swimming aims to assess swimmers propulsive force (Magel, 1970), but its relationship with performance remains a matter of debate in the literature: some authors stands that it is a valid and reliable test (Kjendlie and Thorsvald, 2006) but others questioned it, mainly because arm and hand actions seem to differ (Maglischo and Maglischo, 1984). The purpose of the present study was to analyze the relationship between the force production assessed through a tethered swimming test and free swimming performance.

Twelve male swimmers, of different competitive age-groups, of the Portuguese national team were studied: (i) group 1 - 6 swimmers (20.2±1.2 years; 179.3±12.1cm; 73.6±6.2kg) and (ii) group 2 - 6 swimmers (16.3±0.5 years; 181.0±5.4cm; 72.7±6.5kg). After a 1200m freely chosen 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 average pulling force in 30s (AvgF), average of all the maximum peak force values of each stroke cycle (MaxF) and average of all the minimum force values of each stroke cycle (MinF).

Table 1. Morouço P, et al. Correlations values obtained among parameters. **represents $p < .01$ and * $p < .05$

AvgF	MaxF	MinF	
MaxF	0.87**		
MinF	0.87**	0.94**	
V50m	0.93**	0.81*	0.47
V200m	0.94**	0.93**	0.82**

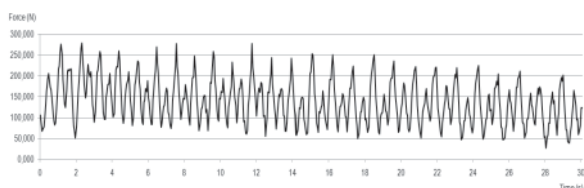


Figure 1. Morouço P, et al. Individual F(t) curve obtained trough front crawl tethered test

(MinF). Twenty-four hours later, swimmers performed a free swimming test in a long course pool: group 1 - 50m front crawl and group 2 - 200m front crawl. Time was registered in order to calculate average velocity of the 50m and 200m (v50m and v200m, respectively).

In Figure 1 it is possible to observe an example of a curve representative of the tethered swimming test, showing the decrease of force production along the 30s effort.

Additionally, in Table 1, the correlation values obtained between the studied variables (Pearson product moment) can be observed. AvgF, and MaxF, were highly correlated with all variables, obtaining both high values with v200m and v50m. These results point out that mean force (as well as maximal force) calculated in 30s maximal tethered front crawl can be considered as a good indicator of the ability to perform short and middle distance front crawl stroke events.

The results seem also to indicate the possibility of the AvgF be able to be used to predict the mean velocity correspondent to a 50m front crawl ($v = 0.004 * \text{tethered force} + 1.331$) and 200m front crawl ($v = 0.004 * \text{tethered force} + 1.208$). In this sense, we encourage the use of the tethered swimming test as a useful toll for training control and evaluation of swimmers and, even, as a simple predictor of performance.

References:

- Kjendlie PL, Thorsvald K. *Port J Sports Sci*, 2006;231-3.
- Magel JR. *Res Q* 1970;41(1):68-74.
- Maglischo CW, Maglischo EW. Proceedings ISBS: *Sports Biomechanics*, 1984;163-76.

Key words: Biomechanics. Strength. Velocity.

Useful strength in badminton, volley, tennis and handball: comparison by means of the Atlas tests

Blasco Lafarga C^{1,2}, Garrido Chamorro RP^{3,4}, Albert Gimenez AR³

¹Department of Physical Education and Sport, University of Valencia, Spain. ²Consell Valencià de l'Esport (Valencian Council of Sport). ³General Hospital, Alicante, Spain. ⁴CEADE medical centre, Almoradi, Alicante, Spain.

Introduction: The aim of this study is to analyse the differences found in the Useful Strength of the main technical movements in four different sports: (Badminton, Tennis, Volleyball and Handball).

Material and methods: We have assessed the Useful Strength in 39 athletes (8 tennis, 10 badminton, 15 handball and 6 volleyball players), analysing: time of acceleration (Tace), maximum force (Fmax), ascending hypotenuse (HASCO), alpha angle (Alpha), beta angle (Beta) and Rate Force Development (RFD), measured by means of the Atlas and applying the triangulation method. The entire tests were developed with specific technical movements.

Results: The mean values for each sport were: Tace was 0.17 seconds (sec) for badminton, 0.20 sec for Tennis, 0.47 sec for handball and 0.27 sec for volleyball; Fmax was 36.01 Newton (N) for badminton, 63.79 N for tennis, 91.04 N for handball and 63.26 N for volleyball; HASCO was 40.39 N/sec for badminton, 67.45 N/sec for tennis, 103.7 N/sec for handball and 69.56 N/sec for volleyball; Angle Alpha was 63.90° for badminton, 71.63° for tennis, 62.52° for handball and 65.41° for volleyball; Angle Beta was 26.08° for badminton, 18.27° for tennis, 27.48° for handball and of 24.5° for volleyball; and RFD was 204.76 N/sec for badminton, 331.1 N/sec for tennis, 196.59 N/sec for handball and 233.9 N/sec for volleyball. We have found significant differences $p < 0.001$ in all the comparatives.

Conclusions: Values, time to peak force, RFD and profile in which we apply the maximum production of force, are different depending on the sport. These four sports have their own useful strength pattern; a determining factor which conditions a different training planning that must be adapted to the specific requirements. The Useful Strength is a multifactorial conditioning factor, mainly specific and technical, and so should be trained.

Key words: Atlas. Evaluation. Useful strength.