

---

# ACTA MÉDICA PORTUGUESA

---

ACTA MED PORT.

ISSN:0870-399X

e-ISSN:1646-0758

## **International Seminar on Physical Activity and Related Injuries: Abstracts**

S3 | 12

Suplemento 3  
Série II  
Lisboa

Volume 25  
Dezembro 2012  
Publicação Bimestral





**Editores Associados**

Fernando Fernandez-Llimos  
Helena Donato  
António Sarmento - Infecçologia  
Diogo Telles Correia - Psiquiatria  
Francisco Carrilho - Endocrinologia  
Luis Curvo Semedo - Imagiologia  
Lino Gonçalves - Cardiologia  
Miguel Almeida - Aluno Medicina  
Hugo Sousa - Investigação Básica  
João Massano - Neurologia  
Jorge Crespo – Medicina Interna  
Margarida Borges - Pneumologia  
Nuno Diogo – Ortopedia  
Pedro Marques da Silva - Medicina Interna  
Rui Maio – Cirurgia  
Tiago Villanueva - Medicina Geral e Familiar

**Coordenação Editorial**

Carla de Sousa

**Assistente Editorial**

Miguel Reis

**Paginação/Design Gráfico**

Rui Matos

**Consultora de Epidemiologia**

Inês Fronteira

**Consultores de Estatística**

António Gouveia  
Pedro Aguiar

**Imagem Médica**

Jorge Crespo

**Open Journal System**

José Carona Carvalho

**Editores Emeriti**

Alberto Galvão Teles (1978 – 1987)  
F. Veiga Fernandes (1987 – 1993)  
A. Sales Luís (1993 – 1996)  
Carlos Ribeiro (1996 – 1998)  
J. Germano Sousa (1999 – 2004)  
Pedro Nunes (2005 – 2010)

**Secretariado**

Av. Almirante Gago Coutinho, 151  
1749-084 Lisboa, Portugal.  
Tel: 218 428 215  
E-mail: [submissao@actamedicaportuguesa.com](mailto:submissao@actamedicaportuguesa.com)

II Série, Volume 25, Suplemento 3, Dezembro 2012  
Data de Publicação: 7 Dezembro 2012  
ISSN:0870-399X | e-ISSN: 1646-0758



**Conselho Científico**

**Presidentes dos Colégios da Especialidade**

Anatomia Patológica: Pedro Soares de Oliveira  
Anestesiologia: Paulo Ferreira de Lemos  
Angiologia e Cirurgia Vasculare: J. Fernandes e Fernandes  
Cardiologia: Mariano Pego  
Cardiologia Pediátrica: Fátima Pinto  
Cirurgia Cardioratória: Manuel Antunes  
Cirurgia Geral: Pedro Coito  
Cirurgia Maxilofacial: Paulo Coelho  
Cirurgia Pediátrica: Paolo Casella  
Cirurgia Plástica Reconstructiva e Estética: Victor Fernandes  
Dermato-venereologia: Manuela Selores  
Doenças Infecciosas: Fernando Maltez  
Endocrinologia/Nutrição: Mário Rui Mascarenhas  
Estomatologia: Rosário Malheiro  
Farmacologia Clínica: Henrique Luz Rodrigues  
Gastroenterologia: José Cotter  
Genética Médica: Jorge M. Saraiva  
Gestão em Saúde: Adalberto Campos Fernandes  
Ginecologia / Obstetrícia: João Silva Carvalho  
Hematologia Clínica: Alexandra Mota  
Imagiologia: Filipe Caseiro Alves  
Imunoalergologia: Elza Tomás  
Imunohemoterapia: Maria Helena Alves  
Medicina Desportiva: Paulo Beckert  
Medicina Física e de Reabilitação: Cecília Vaz Pinto  
Medicina Geral e Familiar: José Silva Henriques  
Medicina Interna: Ducla Soares  
Medicina Legal: Teresa Magalhães  
Medicina Nuclear: Maria do Rosário Vieira  
Medicina do Trabalho: Lopes Pires  
Medicina Tropical: J. Lopes Martins  
Nefrologia: João Ribeiro Santos  
Neurologia: José R. Barros  
Neuroradiologia: João A. Marques Xavier  
Oftalmologia: Rui Daniel Proença  
Oncologia Médica: Maria Helena Gervásio  
Ortopedia: Paulo Felicíssimo  
Otorrinolaringologia: Artur Condé  
Patologia Clínica: Manuel Cirne Carvalho  
Pediatria: J. Lopes dos Santos  
Pneumologia: Henrique Queiroga  
Psiquiatria: J. Marques Teixeira  
Psiquiatria da Infância e da Adolescência: Manuel Monteiro  
Radiodiagnóstico: Isabel Ramos  
Radioterapia: Ângelo Oliveira  
Reumatologia: Maria João Salvador  
Saúde Pública: Eduardo Duarte  
Urologia: J. Palma dos Reis

**Coordenadores Subespecialidades**

Cardiologia de Intervenção: Vasco Ribeiro  
Cuidados Intensivos Pediátricos: Augusto Ribeiro  
Electrofisiologia Cardíaca: Pulido Adragão  
ECG/Neurofisiologia: Maria Regina Andrade  
Gastroenterologia Pediátrica: Fernando Pereira  
Hepatologia: Rui Tato Marinho  
Medicina Intensiva: Rui Moreno  
Nefrologia Pediátrica: Daniel Virella  
Neonatalogia: Maria Teresa Neto  
Neuropediatria: Célia Barbosa  
Oncologia Pediátrica: Lucília Antonieta Caseiro Norton

**Coordenadores Competências**

Acupuntura Médica: J. Pires da Silva  
Emergência Médica: Carlos Mesquita  
Gestão dos Serviços de Saúde: Filipa Carneiro  
Hidrologia Médica: Luís Cardoso Oliveira  
Medicina da Dor: Beatriz Gomes  
Medicina Farmacéutica: Ana Maria Nogueira  
Medicina Hiperbárica: Óscar Camacho

Adalberto Campos Fernandes  
A. Castro Caldas  
A. Meliço Silvestre  
A. Sousa Guerreiro  
António Coutinho  
António Parreira  
António Rendas  
António Vaz Carneiro  
Catarina Resende de Oliveira  
Celso Matos (Bélgica)  
Constantino Sakellarides  
Corália Vicente  
Daniel Lavanchy (Suíça)  
Daniel Sampaio  
Daniel Serrão  
Domhall MacAuley (Reino Unido)  
Duarte Nuno Vieira  
Eduardo Barroso  
Esperança Pina  
F. Caseiro Alves  
F. Castro e Sousa  
Fátima Carneiro  
Flair Carrilho (Brasil)  
Francisco Antunes  
Francisco Cruz  
Francisco George  
Graça Porto  
H. Bicha Castelo  
Henrique Barros  
João O'Neill  
J. Ducla Soares  
J. Mendes Almeida  
J. M. Caldas de Almeida  
J. M. Nascimento Costa  
J. Pereira Miguel  
J. Rodrigues Pena  
Jaime Branco  
João Gíria  
João Lobo Antunes  
João Paço  
José Fraga  
José Luís Medina  
José Luiz Gomes Amaral (Brasil)  
José Martinez Oliveira  
Juan Gervas (Espanha)  
Linhars Furtado  
Luís Costa  
Luís Taborada Barata  
Manuel Abecassis  
Manuel Antunes  
Manuela Carvalho  
Maria Carmo Fonseca  
Miguel Carneiro de Moura  
Miguel Castelo Branco  
Miguel Castelo Branco Sousa  
Miguel Correia  
Miguel Oliveira e Silva  
Paul Hébert (Canadá)  
Paulo Costa  
Paulo Ferrinho  
Pedro Pita Barros  
Richard Roberts (EUA)  
Rueff Tavares  
Rui Victorino  
Sobrinho Simões

**Ordem dos Médicos / Portuguese Medical Association**

**Presidente**

José Manuel Silva

**Presidentes dos Conselhos Regionais**

**Norte:** Miguel Guimarães • **Centro:** Fernando Gomes • **Sul:** Pereira Coelho

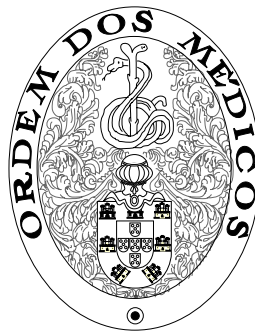


**Índice:****■ Abstracts**

Physical Activity for the Elderly: Benefits in Terms of Functional Incapacity and Corporal Composition.....	1
Assessment of the Levels of Physical Activity Among Teachers in Public Schools in the City of Uruará-PA, Brazil .....	1
Ecotourism as a Contribution to Physical Well-being .....	1
Incidence of Sports Injuries in Wrestling During Training in Top Level Sport .....	2
Physical Activity Patterns during Pregnancy in a Sample of Portuguese Women.....	2
Effect of a Specific Balance Exercise Program in Portuguese Elders.....	2
Effectiveness of a Specific Spinal Exercise Program for Posture in Elderly.....	3
Effect of Increased Ventilatory Demand on Standing and "All-four's" Positions and on Muscles' Activation Intensity .....	3
Motor Control vs. Ventilatory Function in Controlled Asthmatics .....	4
Physical Inactivity and Respiratory Dysfunction: Analysis of Corporal Composition and Spirometry Values.....	4
Factors that Influence Adherence to Exercise among Patients Attending a Cardiac Rehabilitation Program.....	4
The Isokinetic Evaluation of the Dominant and Non-dominant Knee in Professional Football Players.....	5
Oxidative Stress in the Rupture of the Anterior Cruciate Ligament .....	5
Functional Fitness, Balance and Occurrence of Falls in Elderly .....	6
Effects of Training with Additional Loads on the Risk Factors of Metabolic Syndrome in Individuals with Spinal Cord Injury .....	6
Assessment of Nutritional Status in School Children Under Three Classification Criteria .....	6
Assessment of Anthropometry and Body Fat Percentage in School Children in the Brazilian City of Montes Claros .....	7
Effect of Strength Training Intensity in Blood Pressure, Heart Rate and Rate Pressure Pro-duct Response in Grade 1 Hypertensive Males .....	7
Effect of Strength Training Intensity on 24 Hours Ambulatory Blood Pressure After Exercise in Hypertensive Males.....	8
Is Isokinetic Conventional Ratio "Hcc:Qcc" a Good Indicator of Injury Risk? .....	8
Effectiveness of a Neuromuscular and Proprioceptive Combination Training Program in Preventing Injuries in Youth Soccer Players .....	9
The Role of Growth Factors in Skeletal Muscles Regeneration.....	9
Exploratory Phase of Implementation of AD-HOC Tool for Assessment of Aquatic Readiness of Babies.....	10

**Table of Contents:****Abstracts**

Physical Activity for the Elderly: Benefits in Terms of Functional Incapacity and Corporal Composition.....	1
Assessment of the Levels of Physical Activity Among Teachers in Public Schools in the City of Uruará-PA, Brazil.....	1
Ecotourism as a Contribution to Physical Well-being.....	1
Incidence of Sports Injuries in Wrestling During Training in Top Level Sport.....	2
Physical Activity Patterns during Pregnancy in a Sample of Portuguese Women.....	2
Effect of a Specific Balance Exercise Program in Portuguese Elders.....	2
Effectiveness of a Specific Spinal Exercise Program for Posture in Elderly.....	3
Effect of Increased Ventilatory Demand on Standing and "All-four's" Positions and on Muscles' Activation Intensity.....	3
Motor Control vs. Ventilatory Function in Controlled Asthmatics.....	4
Physical Inactivity and Respiratory Dysfunction: Analysis of Corporal Composition and Spirometry Values.....	4
Factors that Influence Adherence to Exercise among Patients Attending a Cardiac Rehabilitation Program.....	4
The Isokinetic Evaluation of the Dominant and Non-dominant Knee in Professional Football Players.....	5
Oxidative Stress in the Rupture of the Anterior Cruciate Ligament.....	5
Functional Fitness, Balance and Occurrence of Falls in Elderly.....	6
Effects of Training with Additional Loads on the Risk Factors of Metabolic Syndrome in Individuals with Spinal Cord Injury.....	6
Assessment of Nutritional Status in School Children Under Three Classification Criteria.....	6
Assessment of Anthropometry and Body Fat Percentage in School Children in the Brazilian City of Montes Claros.....	7
Effect of Strength Training Intensity in Blood Pressure, Heart Rate and Rate Pressure Pro-duct Response in Grade 1 Hypertensive Males.....	7
Effect of Strength Training Intensity on 24 Hours Ambulatory Blood Pressure After Exercise in Hypertensive Males.....	8
Is Isokinetic Conventional Ratio "Hcc:Qcc" a Good Indicator of Injury Risk?.....	8
Effectiveness of a Neuromuscular and Proprioceptive Combination Training Program in Preventing Injuries in Youth Soccer Players.....	9
The Role of Growth Factors in Skeletal Muscles Regeneration.....	9
Exploratory Phase of Implementation of AD-HOC Tool for Assessment of Aquatic Readiness of Babies.....	10



## Physical Activity for the Elderly: Benefits in Terms of Functional Incapacity and Corporal Composition

Rui PAULO, João BRITO

**Introduction:** Physical activity contributes to an improved quality of life for the elderly and towards a decrease in the occurrence of health problems (Leenders, 2003).

This research attempted to determine the functional capacity (FC) and the body mass index (BMI) in sedentary elderly population compared to those having structured and unstructured physical activity practice. The sample was composed of 90 individuals with an average age of  $74.8 \pm 7.9$  years, divided into three groups: the control group (CG) composed of 26 sedentary elderly people (aged  $74.9 \pm 8.0$  years); experimental group 1 (EG1) composed of 26 elderly people (aged  $73.1 \pm 6.3$  years) doing unstructured PA (e.g. going for walks); and experimental group 2 (EG2) composed of 38 elderly people (aged  $75.8 \pm 8.8$  years) doing supervised exercise with moderate intensity.

**Methods:** FC was measured by the Fullerston's Functional Fitness Test (Rikli and Jones, 1999). BMI was measured by standard scale. SPSS 19.0 software was used for data validation, and descriptive statistics was used (means, standard deviation, frequencies and percentages). Analyses of variance (ANOVA) were used for baseline group comparison and Scheffé post-hoc analysis was performed when the analysis of variance showed statistical differences.

**Results:** The EG2 achieved significantly better results in all the functional tests ( $p \leq 0.05$ ), back scratch, chair sit-and-reach, 30-s chair stand, arm curl, 8-ft up-and-go and 6-min walk, when compared to the CG.

**Conclusions:** The results showed that regular supervised physical activity is more efficient improving functional fitness in the elderly population.

### REFERENCES

1. Leenders, N. (2003). 'The Elderly' in Ehrman, J., Gordon, P., Visich, P. and Keteyian, S. *Clinical Exercise Physiology*, pp. 571-87. Champaign: Human Kinetics.
2. Rikli, R. and Jones, C. (1999). 'Development and validation of a functional fitness test for community-residing older adults.' *J Aging Physical Activity*. 7:129-61.

R.P.: Escola Superior de Educação, Instituto Politécnico de Castelo Branco, Portugal.  
J.B.: Laboratório de Investigação em Desporto [Sports Research Laboratory], Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Santarém, & Centro de Investigação em Desporto [Sports Research Centre], Saúde e Desenvolvimento Humano [Human Health and Development], Vila Real, Portugal.

## Assessment of the Levels of Physical Activity Among Teachers in Public Schools in the City of Uruará-PA, Brazil

Reinaldo CAJAIBA, F. SÍLVIO MAIA, Fabrício OLIVEIRA

**Introduction:** Physical activity is considered, among other factors, an important element in promoting health and quality of life. The

present study was aimed to assess the Physical Activity Levels (PAL) among teachers of public schools in the urban area of the city of Uruará-PA.

**Methods:** The short version of the International Physical Activity Questionnaire (IPAQ) was applied and validated for the Brazilian population by Matsudo *et al.* (2001). SPSS 19.0 software was used for data validation, and descriptive statistics was used (means, standard deviation, frequencies and percentages) as well as the Mann-Whitney test to compare physical activity levels between men and women.

**Results:** A total of six schools were surveyed, with 148 teachers with a mean age of  $34.56 \pm 9.74$  assessed. Of these, 54.73% ( $n = 81$ ) were women and 45.27% ( $n = 67$ ) were men. Of the total sample ( $n = 148$ ), 10.14% were classified as Very Active, 35.14% were classified as Active, 24.99% as Not Sufficiently Active-A, 12.84% as Not Sufficiently Active-B and 16.89% as Sedentary. Although male teachers have obtained higher scores on the Very Active classification, there was no significant difference ( $p > 0.05$ ).

**Conclusions:** These results were very important for planning and running of campaigns aimed to promote increased PAL in the referred population, since these professionals are exposed to high levels of stress in their daily activities (Esteve, 1999).

### REFERENCES

1. Matsudo, S., Araújo, T., Matsudo, V., Andrade, D., Andrade, E., Oliveira, L. & Braggion G. (2001). Questionário Internacional de Atividade Física (IPAQ): estudo de validade e reprodutibilidade no Brasil. *Revista Atividade Física & Saúde* 6(2), 5-18.
2. Esteve, J.M. (1999). O mal-estar docente: a sala-de-aula e a saúde dos professores. Bauru (SP): Edusc.

R.J.: University of Trás-os-Montes e Alto Douro

## Ecotourism as a Contribution to Physical Well-being

Reinaldo CAJAIBA, Fabrício OLIVEIRA, F. SÍLVIO MAIA

**Introduction:** Due to the increased demand for outdoor activities in sparsely populated areas, ecotourism and other related forms of tourism are among the fastest growing sectors in the tourism industry in Brazil and around the world, being mostly associated to leisure and physical well-being. The present study aimed to survey the ecotourism activities most practiced in the city of Uruará-PA.

**Methods:** Data were collected by open and closed questions, and a descriptive analysis using Microsoft Excel. 217 people were interviewed (58.98% men and 41.02% women).

**Results:** According to the results, only 31.80% practiced some kind of ecotourism activity, while 68.20% did not perform any ecotourism activity. According to respondents, the reasons why they do



not practice ecotourism activities are: lack of opportunity (11.43%), health problems (14.14%), lack of information on this type of tourism (24.59%), lack of time (25.65%) and lack of interest (24.19%). Respondents who said they participated in ecotourism activities affirmed they intended to maintain this habit and felt the following sensations during the practice: physical health/calorie burning/physical well-being (44.93%), adrenaline/excitement/risk/adventure (26.09%), contact with nature (13.04%), peace of mind/renovation/quiet/ease/harmony (7.25%), experience of something new/ unknown (5.80%) and sociability (2.90%).

The most practiced activities were hiking trails (56.52%), camping (21.74%), caving (8.70%), rappel (2.90%), canoeing (2.90%), others (7.25%).

**Conclusions:** Our findings are consistent with Bruhns (2003) who affirmed that ecotourism activities provide some sort of physical well-being and, thus, a better quality of life to practitioners.

## REFERENCES

1. Bruhns, H.T. (2003). No ritmo da aventura: explorando sensações e emoções. In: Marinho, A. & Bruhns, H.T. Turismo, lazer e natureza. Barueri, SP: Manole.

R.C.: University of Trás-os-Montes e Alto Douro

## Incidence of Sports Injuries in Wrestling During Training in Top Level Sport

Przemyslaw LUTOMSKI, Ewa JANKOWSKA, Jan KONARSKI

**Introduction:** Achievements in top level sport are not only the result of a good training program but also involves knowledge on the influence of training-competition loads on competitors' fitness and health. Such data is important when altering a training programme and can reduce the risk of injury. The aim of the study was to analyse the causes, incidence and injuries location among top level female wrestling competitors.

**Methods:** The study included adult female members of the Polish National Freestyle Wrestling Team (n = 18), with a training history of 4-10 years. Most are professional wrestlers (89%), and the remainder are (11%). The subjects participated in five training sessions/week and in competition events in the competition calendar. Wrestlers were assessed using research form. Results were analysed using Excell and Statistica 8.0 (percentages).

**Results:** Analysis of the results showed that 88.9% of those studied sustained an injury when wrestling. The most common injuries involved sprains and dislocations (68.8%), torn or ruptured muscle/tendon fibres (56.3%) and fractures (12.5%). Team Doctor and wrestlers opinion is that causes of injury were: lack of appropriate warm-up prior to training (34.8%), training intensity levels inappropriate to competitors' current capabilities (21.7%), and methodological errors during training (8.7%). Accidents and previous injuries appeared to cause same location injury or reoccurrence (30.4% and 4.4% respectively). Analysis of training programme showed that male dominant sports, where females engaged in similar training, did not account for gender differences.

**Conclusions:** Results demonstrated that gender differences when taken into account in training, would have a major factor in injury reduction. This could contribute to better sports results, reduce treatment costs and shorten breaks in training/competition resulting from injury or injury reoccurrence.

P.L., E.J., J.K.: University School of Physical Education in Poznan

## Physical Activity Patterns during Pregnancy in a Sample of Portuguese Women

P.C. SANTOS, S. ABREU, C. MOREIRA, D. LOPES, M. FERREIRA, R. SANTOS, O. ALVES, S. VALE, A. VALENTE, P. MOREIRA, J. MOTA.

**Purpose:** This paper has two goals: (1) To analyze the perception of physical activity (PA) patterns during pregnancy according to weekly time spent on different types of activity, and (2) to determine women's perception about physical activity recommendations from health care providers during pregnancy.

**Methods:** A longitudinal prospective study was carried out with a cohort of 118 pregnant women. Participants were evaluated in all trimesters. Self-reported questionnaires were used to collect personal and obstetric data. Type, duration and frequency of PA were evaluated using the Pregnancy Physical Activity Questionnaire (PPAQ) and intensity levels were calculated. Repeated measure analysis of variances was performed to access differences between trimesters, and Wilcoxon signed-rank test was performed when appropriate.

**Results:** A decrease in values of self-reported PA (MET.h.wk-1) was found over the trimesters of pregnancy for respectively, total, light and moderate intensity (p < 0.01 for all). Time spent in most activities remained fairly stable throughout pregnancy. Women spend most of their weekly time during the whole pregnancy in household and caregiving activities, occupational activities and leisure except sport activities. Swimming was the most reported organized PA, reaching its highest proportion (12.7%) in the second trimester. Prenatal exercise classes were reported by 39.8% of women during the 3<sup>rd</sup> trimester. Pregnant women reported that PA was recommended by health professionals – 53.9% in 1<sup>st</sup> trimester, 70.4% in 2<sup>nd</sup> trimester and 56.8% in 3<sup>rd</sup> trimester.

**Conclusions:** Self-reported PA decreased during pregnancy especially in total, light and moderate intensity. Women spend most of their weekly time in domestic, occupational and leisure except sports activities. There still are some healthcare providers that do not recommend physical activity during pregnancy.

P.C.S.: Department of Physiotherapy - Escola Superior de Tecnologias da Saúde do Porto- Polytechnic Institute of Porto. & Research Centre in Physical Activity, Health and Leisure, Faculty of Sport, University of Porto, Portugal.

S.A., C.M., M.F., R.S., S.V., J.M.: Research Centre in Physical Activity, Health and Leisure, Faculty of Sport, University of Porto, Portugal.

D.L.: Clinical Practice.

O.A.: Ponte da Barca Health Unit, Alto Minho Local Health Unit, Portugal.

P.M.: Faculdade de Nutrição, University of Porto. & Research Centre in Physical Activity, Health and Leisure, Faculty of Sport, University of Porto, Portugal.

## Effect of a Specific Balance Exercise Program in Portuguese Elders

Cristina ARGEL DE MELO, Adriana GOMES, António MESQUITA MONTES, Rubim SANTOS, Carlos CRAS-TO, Isabel TARRIO, Nuno CARVALHO, Tiago SOUSA.

**Relevance:** Old people's balance deterioration is considered a risk factor that can explain the increased number of falls in Portuguese population. Specific exercise programs can prevent balance's deterioration increasing functional capacity and autonomy.

**Aim:** To analyze the influence of a specific exercise program for balance on center of pressure (COP) oscillation's in Portuguese independent elders.

**Methods:** Data were collected from 25 volunteers aged 65 years or older (mean age of  $71.8 \pm 5.4$  years). The twelve subjects of experimental group (EG) underwent in a specific exercise program with balance exercises during six months, while thirteen subjects from the control group (CG) did not engage in any exercise program. Balance exercises included sit to stand, one leg standing, forward and lateral reach and rapid voluntary stepping. Overload principle was respected in all exercises. All participants were assessed before and after intervention with open and closed eyes, using a Bertec® FP4060-10 forceplate and *Acqknowledge*® version 3.9 software for data collection, analysis and signal processing. COP's oscillation area (ACOP), antero-posterior and medial-lateral directions COP maximal oscillation amplitude (AmpCOP) and antero-posterior and medial-lateral directions COP's standard deviation (SDCOP) were calculated. Variables' minimal detectable change (MDC) was calculated.

**Results:** Antero-posterior direction's SDCOP with open eyes ( $U = 43.0$ ;  $p = 0.03$ ) and AmpCOP in the same direction with both open ( $U = 37.0$ ;  $p = 0.013$ ) and closed ( $U = 47.0$ ;  $p = 0.04$ ) eyes improved after 6 months of the specific exercise program in the EG when compared with CG. Moreover, using MDC value ( $0.00144 \text{ cm}^2$ ) 58% of EG participants improved ACOP clinically on with eyes opened and 78% with closed eyes.

**Conclusion:** A specific balance exercise program for older people was effective in improving balance by reducing COP's oscillation.

C.A.M., A.G., A.M.M., R.S., C.C., I.T., N.C., T.S.: School of Allied Health Sciences (ESTSP) Oporto Polytechnic Institute. Porto. Portugal.

## Effectiveness of a Specific Spinal Exercise Program for Posture in Elderly

Cristina ARGEL DE MELO, Carlos CRAS-TO, António MESQUITA MONTES, Rubim SANTOS, Adriana GOMES, Isabel TARRIO, Nuno CARVALHO, Tiago SOUSA.

**Relevance:** With aging, the posture tends to become flexed, often with thoracic hyper kyphosis with head protraction, which may lead to an impaired function and increased risk of falls.

**Aim:** To determine the effectiveness of a 6 month specific spinal exercise program on older adults spinal curves and to evaluate postural differences between genders.

**Methods:** Twenty-six old people volunteered to take part of the

study (mean age of  $72.2 \pm 5.8$  years), 14 for the experimental group and 12 for the control group. Experimental group was submitted to a 6 month specific spinal exercise program, twice a week, including cervical retraction for deep neck flexors, bilateral upper limb elevation for spinal extensors, simultaneous upper limbs abduction, extension and lateral rotation for scapular adductors and spinal extensors and pelvic tilts. All sitting exercises were done without spinal support with transversus abdominis and multifidus muscles activity during each exercise. Overload principle was respected in all exercises. Meanwhile, control group did not exercise for 6 months. To evaluate posture it was used photogrammetry by measuring cervical, thoracic, and lumbar angles, and pelvic tilt, in a sitting and standing position. For all normal distribution variables it was used t-test for independent samples, for non normal distribution variables it was used Mann-Whitney test.

**Results:** Specific spinal exercise program was effective in reducing thoracic kyphosis, both in sitting ( $t = 5.135$ ;  $p = 0.001$ ) and standing position ( $U = 14.0$ ;  $p = 0.001$ ), and reducing cervical protraction in sitting ( $U = 32.0$ ;  $p = 0.003$ ) and standing position ( $t = 1.803$ ;  $p = 0.042$ ) when compared with control group. Males showed a great pelvic posterior tilt in sitting ( $t = 3.335$ ;  $p = 0.003$ ) as well in standing ( $t = 3.503$ ;  $p = 0.003$ ) when compared with females.

**Conclusion:** Specific spinal exercise program decreased thoracic curve and head protraction. Males tend to show greater pelvic posterior tilt, in standing and sitting positions, when compared with females.

C.A.M., C.C., A.M.M., R.S., I.T., N.C.: School of Allied Health Sciences (ESTSP) Oporto Polytechnic Institute. Porto. Portugal.

## Effect of Increased Ventilatory Demand on Standing and "All-four's" Positions and on Muscles' Activation Intensity

António MESQUITA MONTES, Bárbara SILVA, Daniel COSTA.

**Relevance:** Increasing ventilatory demand may affect motor control.

**Aim:** To evaluate the effect of an inspiratory resistance in standing (S) and in "all-four's" (AF) positions on muscles' activation intensity (AI) in healthy subjects.

**Methods:** Cross-sectional study's sample was composed by twenty university volunteer students ( $21 \pm 1.5$  years). An independent flow Threshold® IMT with a resistance of 15% of maximal inspiratory pressure was used to sustain inspiratory resistance. Participants were asked to ventilate deeply and at their own rhythm, during 90 sec. in S and in AF. To assess muscles AI it was used surface electromyography on diaphragm (D), external oblique (EO), rectus abdominis (RA), transversus abdominis/internal oblique (TrA/IO), erector spinae (ES) and multifidus (Mu). Muscles AI were analyzed in each position, during inspiration in the first 10 sec. (T1) and 10 sec. after the end of the first minute (T2).

**Results:** Both in S and AF, there were significant differences between T1 and T2 on TrA/IO ( $t = -2.85$   $p = 0.01$ ) and ES ( $t = -2.16$   $p = 0.04$ ). When comparing S and AF at T1 it was detected a significantly increased in TrA/IO ( $t = -3.82$   $p = 0.001$ ) ES ( $t = -2.28$

$p = 0.03$ ) and Mu AI ( $t = -2.6$   $p = 0.02$ ) in the latter. When both position were compared at T2 muscle AI in AF was significantly increased in EO ( $t = -2.62$   $p = 0.02$ ), ES ( $t = -4.98$   $p = 0.001$ ) and Mu ( $t = -2.92$   $p = 0.01$ ) when compared with S. When using repeated measures it was observed a significant interaction between S and AF and EO, RA and TrA/IO AI ( $F = 7.56$   $p = 0.002$ ). Same results were observed in D and TrA/IO AI ( $F = 7.96$   $p = 0.01$ ). Both D and TrA/IO AI depended on T1 and T2 as well on S and AF ( $F = 4.92$   $p = 0.04$ ).

**Conclusion:** An inspiratory resistance produces inspiratory as well as expiratory muscle activation in healthy subjects. Furthermore, muscle activation intensity depends on the position and D and TrA/IO activated together to coordinate ventilatory/postural functions.

A.M.M., B.S., D.C.: School of Allied Health Sciences of Porto, Oporto Polytechnic Institute, Porto, Portugal.

## Motor Control vs. Ventilatory Function in Controlled Asthmatics

António MESQUITAMONTES, Paulo CARVALHO, Daniel COSTA, Camilo MOREIRA, Cristina ARGEL DE MELO.

**Relevance:** Spine is submitted to postural challenges that are controlled by postural and ventilatory strategies that may not occur in increased ventilatory demand as asthma.

**Aim:** To analyze motor control characteristics and ventilatory function parameters' differences between controlled asthmatics and healthy subjects.

**Methods:** A cross-sectional study as been carried out with a sample of 14 volunteer university students, 7 belonging to an asthmatic group (AG) –  $21.7 \pm 1.1$  years – (subjects with a self-reported and controlled asthma classified according to Global Initiative of Asthma criteria) and 7 to an healthy group (HG) –  $20.3 \pm 2.7$  years. To assess postural strategy it was chosen an upper limb fast movement in which it was used the timing of electromyography (EMG) onset and the pattern of muscle recruitment on deltoid, diaphragm, erector spinae, multifidus, external oblique, rectus abdominis and transversus abdominis/internal oblique surface EMG was used. Some ventilatory function parameters were evaluated: predicted forced expiratory volume in one-second percentage, peak expiratory flow, maximal voluntary ventilation, maximum inspiratory and expiratory pressures.

**Results:** Both groups were similar in age, height and weight. During upper limb fast movement AG showed a timing of EMG onset significantly greater in the diaphragm ( $U = 0$ ;  $p < 0.001$ ) and transverse abdominis/internal oblique ( $U = 14$ ;  $p < 0.001$ ) when compared to HG. AG ventilatory function presented diminished predicted forced expiratory volume in one second ( $U = 0$ ;  $p = 0.001$ ), peak expiratory flow ( $U = 8$ ;  $p = 0.038$ ) and maximum expiratory pressure ( $U = 4$ ;  $p = 0.006$ ) when compared with HG.

**Conclusion:** Controlled asthmatics seem to have changes in motor control strategies, specifically in timing of EMG onset, which may be an indicator of an impaired ventilatory function. To better coordinate postural and ventilatory functions, motor control specific training may help intervention and ventilation control in asthma.

A.M.M., P.C., D.C., C.M., C.A.M.: School of Allied Health Sciences of Porto, Polytechnic Institute of Porto, Porto, Portugal.

## Physical Inactivity and Respiratory Dysfunction: Analysis of Corporal Composition and Spirometry Values

Rui PAULO, João PETRICA, Júlio MARTINS

**Purpose:** This study was intended to compare sedentary subjects with physically active subjects in body composition and pulmonary volume capacity.

**Results:** The sample was composed of 86 students in higher education, with an average age of  $21.3 \pm 2.4$  years, divided into two groups: a control group (CG) made up of 28 sedentary students (aged  $20.9 \pm 1.3$  years), and an experimental group (EG) of 58 students (aged  $21.5 \pm 2.8$  years) doing supervised moderate to vigorous acyclic exercise (aerobic/anaerobic), with the aim of improving physical fitness.

**Methods:** To categorize the sample we used a questionnaire from Telama *et al.* (1997). We evaluated the Peak Expiratory Flow, the Forced Expiratory Volume in first second and the Forced Vital Capacity, with Cosmed's Microquark spirometer, the body mass index (BMI) and waist circumference (WC) values. SPSS 19.0 software was used for data validation, and descriptive statistics was used (means, standard deviation, frequencies and percentages). T-test was used for independent samples, and the Mann-Whitney test for non-parametric measurements, adopting a significance level of 5%.

**Results:** The EG achieved significantly better results ( $p \leq 0,05$ ) in BMI, WC and all of the assessed spirometric values, compared to the CG.

**Conclusions:** We found that students who did regular supervised exercise had lower indices of BMI and WC, and better pulmonary function. The values for those with unfavorable BMI and WC are likely to cause respiratory dysfunction, in terms of ventilation and pulmonary volume, restricting the amount of PA and increasing the chances of metabolic and respiratory diseases.

## REFERENCES

1. Dias, D., *et al.* (2008). 'Comparação da aptidão física relacionada à saúde de adultos de diferentes faixas etárias'. *Rev Bras Cineantrop Desemp. Hum.* 10(2):123-128.
2. Telama, R., *et al.* (1997). 'Physical activity in childhood and adolescence as predictor of physical activity in young adulthood'. *Am J Prev Med* 13 (4): 317-323.

R.P., J.P.: Escola Superior de Educação do Instituto Politécnico de Castelo Branco, Portugal.

J.M.: Universidade de Beira Interior, Covilhã, & CIAFEL – Centro de Investigação em Atividade Física [Physical Activity Research Centre], Saúde e Lazer [Health and Leisure], Faculdade de Desporto [Sports Faculty], Universidade do Porto, Portugal.

## Factors that Influence Adherence to Exercise among Patients Attending a Cardiac Rehabilitation Program

A.M. SILVA, A. NOITES.



**Objective:** The aim of this study was to compare the factors of adherence to physical activity in subjects attending a cardiac rehabilitation program, and subjects who have withdrawal this same program using the Transtheoretical Model of behavior change.

**Methods:** We conducted an observational, cross sectional type study, with a sample of 33 individuals (15 currently participating in the Cardiac Rehabilitation Program and 18 who no more attended the same program), with the questionnaires being personally delivered or sent by mail. For data analysis, we used the computer program SPSS® version 16.0. The significance level was set at 0.05.

**Results:** There were no significant differences in the states of Change, Self-efficacy, Decisional Balance and Change Processes in both groups. We obtained a high Spearman correlation between States of Change and Self-efficacy ( $r^2 = 0.778$ ) and the Pros ( $r^2 = 0.764$ ) and Againsts ( $r^2 = -0.744$ ) in Decisional Balance.

However, there were no significant evidence to affirm that States of Change and experiential processes of change ( $p = 0.465$ ) and behavioral ( $p = 0.300$ ) had a correlation. A relationship was found, in terms of proportions between physical activity incorporated or not in a Cardiac Rehabilitation Program and age ( $p = 0.003$ ), occupation ( $p = 0.010$ ) and the entity paying the costs of program ( $p = 0.027$ ).

**Conclusion:** It was concluded that perceived self-efficacy and Pros and Againsts of the Decisional Balance are related to adherence to physical activity. Results also point out that age, profession and the entity paying the costs of the program influences the drop-out of Cardiac Rehabilitation Programs.

A.M.S., A.N.: Superior School of Health Technologies of Porto, & Polytechnic Institute of Porto, Porto, Portugal.

## The Isokinetic Evaluation of the Dominant and Non-dominant Knee in Professional Football Players

Cleiton CHIAMONTI BONA, Nelson João TAGLIARI, Luciana Pauline MATTE

**Introduction:** The performance sport has a very high probability of injury due to mechanical stress. Some of these injuries can be caused by muscle imbalances, which makes it important strength testing to evaluate the level of muscle deficits. The aim of this study was to evaluate and compare the peak torque in the lower limbs flexion and extension of the dominant knee (DK) and not dominant knee (NDK) in professional football players.

**Methods:** We studied 20 male athletes with  $23.75 \pm 5.29$  years old, height  $1.78 \pm 0.07$  meters and weight  $74.6 \pm 7.6$  kg. Isokinetic dynamometer (Biodex Multi Joint System 3 Pro) was used to assess the peak torque of knee flexion and extension (concentric/eccentric). The evaluation was conducted at three angular velocities of  $60^\circ/s$ ,  $180^\circ/s$  and  $300^\circ/s$ , with five repetitions in the first two speeds and 20 repetitions at  $300^\circ/s$  with an interval of 30 seconds between each. All isokinetic tests were performed by the same evaluators for better standardization and control. The data were presented in Microsoft® Excel Windows with descriptive analysis and t-test for compare means (with  $p \leq 0.05$ ). Subjects were evaluated at the beginning of the training season (pretest).

**Results:** Extension of DK at  $60^\circ/s$  peak torque resulted in an average value of  $259.78 \pm 43.73$  Nm and  $261.83 \pm 39.29$  Nm for the NDK, no significant differences ( $p = 0.440$ ) were identified. At the same speed, flexion of DK was  $140.31 \pm 27.51$  Nm and  $135.10 \pm 18.02$  Nm for NDK, no significant differences ( $p = 0.247$ ) were identified. Extension of DK at  $180^\circ/s$  peak torque resulted in an average value of  $170.59 \pm 29.09$  Nm and  $171.07 \pm 23.66$  Nm for the NDK, no significant differences ( $p = 0.477$ ) were identified. At the same speed, flexion of DK was  $104.24 \pm 16.01$  Nm and  $99.74 \pm 18.06$  Nm for NDK, no significant differences ( $p = 0.210$ ) were identified. At last, extension of DK at  $300^\circ/s$  peak torque resulted in an average value of  $127.44 \pm 17.85$  Nm and  $129.12 \pm 16.36$  Nm for the NDK, no significant differences ( $p = 0.381$ ) were identified. At the same speed, flexion of DK was  $85.25 \pm 13.88$  Nm and  $82.00 \pm 13.24$  Nm for NDK, no significant differences ( $p = 0.232$ ) were identified.

**Conclusions:** The professional football players studied did not show significant differences in knee muscle strength (dominant vs. non-dominant), showing a good muscle balance. It also have been showed that at highest speed, lower is the peak torque of this subjects. The good muscular balance of professional football players results in lower probability of injury.

C.C.B., N.J.T., L.P.M.: University of Passo Fundo – UPF

## Oxidative Stress in the Rupture of the Anterior Cruciate Ligament

Marlon Francys VIDMAR, Gilnei LOPES PIMENTEL, César Antônio de QUADROS MARTINS, Luciano OLIVEIRA SIQUEIRA, Cleiton CHIAMONTI BONA, Carlos RAFAEL DE ALMEIDA.

**Objective:** To assess oxidative stress in patients with ruptured anterior cruciate ligament (ACL).

**Methods:** An observational cross-sectional study with 11 male subjects ( $31.7 \pm 7.2$  years), with total rupture of ACL with or without meniscal injury (injury time was  $3.2 \pm 1.8$  months). Patients were instructed to not-taking anti-inflammatory and antioxidant substances in the 48 hours preceding data collection. Blood samples were aseptically collected in the antecubital vein, and synovial fluid during the knee ligamentoplasty in the region above and lateral to patellar ligament. All collections were performed in the morning period. The samples were stored without anticoagulants in test tubes and centrifuged at 1500 rpm for 15 minutes, then the serum was extracted and packed in Eppendorff tubes to carry out the biochemical measurements. All aliquots were stored at  $-18^\circ\text{C}$  until the biochemical analysis. Spectrophotometric analysis was performed in semi-automated equipment Biosystems BTS 350. T-test was used to comparing averages between the groups, checking oxidative stress in individuals with ACL rupture.

**Results:** The results showed a statistically significant decrease in the content of polyphenols in the synovial fluid ( $p = 0.04$ ) coupled with an elevation of Thiobarbituric Acid Reactive Substances compared with the plasma ( $p = 0.07$ ).

**Conclusion:** The ACL injury induced antioxidant intake associated with a higher degree of lipid damage through free radicals in the

structures involved by synovial fluid, which could worsen the clinical history of patients.

M.F.V.: University of Health Sciences of Porto Alegre - UFCSPA.  
G.L.P., C.A.Q.M., L.O.S., C.C.B., C.R.A.: University of Passo Fundo – UPF.

## Functional Fitness, Balance and Occurrence of Falls in Elderly

Isabel BICHO, Nelson ESTEVES, João BRITO.

**Objective:** The present study has the aim to identify the relationship between functional fitness, balance and the occurrence of falls in elderly.

**Methods:** Eighty-six individuals participated, 69 women (76.6 ± 7.87 years) and 17 men (78 ± 9.26 years) residing in the district of Castelo Branco. They performed anthropometric assessments of functional fitness - testing battery Rikli and Jones (1999), the balance - battery of tests Balance Scale Fullerton Advanced Rose and Lucchese (2003) and was recorded the occurrence of falls in the last 12 months through interviews. Sample selection was by convenience. We created two groups according to physical activity (physical activity group, PAG, n = 40, and sedentary group SG, n = 46) and three groups based on the number of falls: the group that reported one fall, respectively, of sedentary and physical activity (SG1, n = 11; PAG1, n = 17), group reporting two or more falls (SG2, n = 21; PAG2, n = 10) and a group that has not suffered falls (SG0, n = 13; PAG0, n = 14). Comparisons between multiple groups by Oneway ANOVA test, with *Post-hocTukey's* test for a significance level of  $p < 0.05$ , and t-test. There were no significant differences in the G0 to SG and PAG. Results that may suggest that the elderly in this group are either sedentary or physically active have favorable values of physical fitness. In G1 and G2 there are differences between SG and the PAG at the "stand up and sit down test" (lower force) to, respectively  $p = 0.026$  and  $p = 0.017$ . When comparing between themselves the G0, G1 and G2 of the SG, there are differences in the test of the battery functional fitness "Lift Sit",  $p < 0.000$ , "Sit-Walking 2.44m",  $p < 0.000$ , "Sit-and-Reach",  $p < 0.002$  and "6 minute walking test",  $p < 0.000$  and still in all tests of the battery of balance. When compared among themselves the G0, G1 and G2 of the PAG, there are differences in the tests "Sit-Walking 2.44m",  $p < 0.002$ , "6 minute walking test",  $p < 0.008$ , and all tests of the Balance battery.

**Conclusions:** The results suggest that physical activity seems to have an impact on improving the functional fitness. Elderly people who practice physical activity, have higher values of equilibrium ( $p < 0.000$ ), which reduces the prevalence of falls. In the group of sedentary elderly people there was an inverse association between the number of falls and the score achieved in the tests of the Balance battery.

I.B.: Escola Superior de Educação, Instituto Politécnico de Castelo Branco, Castelo Branco, Portugal.

N.E., J.B.: Escola Superior de Desporto de Rio Maior – IPS

## the Risk Factors of Metabolic Syndrome in Individuals with Spinal Cord Injury

Rosilene SOUZA, Nelson ESTEVES, João BRITO.

**Objective:** The aim of this study was to evaluate the influence of training loads on the risk factors of metabolic syndrome in patients with spinal cord injury.

**Methods:** Twenty male subjects with spinal cord injury below the seventh thoracic vertebra (low paraplegia), were studied and divided into two groups: experimental group (G1, n = 8, 37 ± 3.74 years) and the control group (G2, n = 12, 37.75 ± 3.51 years). Before and after the implementation of the program of strength training (ST) for 12 weeks, height was measured with the subjects positioned horizontally, the body mass, circumferences and skinfolds (WHO, 1995) and a questionnaire on medical history sports. In the morning, at two different times, were analyzed fasting glucose, triglycerides (TG), total cholesterol (TC), HDL-C, LDL-C and VLDC in venous blood samples. For determination of the glucose had been used the method of oxidase enzyme, while for triglycerides (TG) and total cholesterol (TC), HDL-C was used enzymatic colorimetric method. The LDL-C and VLDC was estimated according to the Friedewald's method (1972). The muscle strength was assessed using the test load for maximum repetitions. The ST protocol was applied only to the G1 and was composed by sitting on the bench press, vertical pull, bench press, neutral thread, French triceps, shoulder abduction and rowing machine, had a frequency of three weekly sessions of 60 minutes, 2 - 3 sets of 8 to 15 repetitions / exercise, intensity of 65% to 85% 1RM. The technique of comparison of means for paired samples was used to determine the effects of the program in the variables under study, and the groups were controlled for the initial value through the comparison of means test for independent samples and there were no significant differences. There was a significant decrease in body weight, waist circumference and fat mass percentage in G1 (respectively, for  $p = 0.000$ ,  $p = 0.016$  and  $p = 0.003$ ) compared to G2. There were significant differences in systolic and diastolic blood pressure only in G1 ( $p = 0.022$  and  $p = 0.004$ , respectively) and TC ( $p = 0.037$ ), TG ( $p = 0.000$ ), HDL ( $p = 0.000$ ), LDL ( $p = 0.001$ ), VLDC ( $p = 0.008$ ) and glucose ( $p = 0.000$ ). There were gains in strength in all exercises on the G1.

**Conclusions:** The results of this study suggest that ST contributes to the control of risk factors that characterize the metabolic syndrome.

### REFERENCES:

1. WHO – World Health Organization (1995). Expert Committee on Physical Status: the use and interpretation of anthropometry. Geneva: WHO, v. 854.
2. Friedewald, W.T. (1972). Estimation of de Concentration of low-Density Lipoprotein Cholesterol in Plasma, Without Use of the Preparative Ultracentrifuge. *Clinical Chemistry*. p. 498-503.

R.S.: UTAD, Vila Real, Portugal.

N.E., J.B.: Escola Superior de Desporto de Rio Maior – IPS.

## Effects of Training with Additional Loads on

## Assessment of Nutritional Status in School Children Under Three Classification Criteria

Igor CRUZ, Rodrigo SILVA, Felipe AIDAR, André CARNEIRO, Victor REIS.

**Objective:** To assess the nutritional status of schoolchildren from the Brazilian city of Montes Claros, according to three criteria of classification.

**Methods:** This study is a comparative cross-sectional study involving 382 school children being 151 boys (12.98 ± 1.74 years) and 231 girls (12.56 ± 1.65 years). The criteria used were (C1) Cole et al. (2000), (C2) Conde and Monteiro (2006) and (C3) Centers for Disease Control (CDC, 2000). The height (H) was measured by a fixed stadiometer (Sanny, Brazil) with the individuals in a standing position and after a deep breath, with accuracy of 0.1m, body mass (BM) was measured with a digital scale (Plenna, Brazil) with an accuracy of 100 grams. The formula  $BM/H^2$  was applied to define the Body Mass Index (BMI). Qui Square Independence test was used to access differences between groups. We considered the value of  $\alpha = 0.05$ .

**Results:** The classification of eutrophic (normal weight) had oscillations in C1 (77.5%, 74.0%,  $p \leq 0.05$ ), C2 (67.5%, 63.2%,  $p \leq 0.05$ ) and C3 (68.9%, 70.1%,  $p \leq 0.05$ ) and in the overweight C1 (15.9%, 18.2 %,  $p \leq 0.05$ ), C2 (23.8%, 22.9%,  $p \leq 0.05$ ) and C3 (10.6%, 16.0%,  $p \leq 0.001$ ), as well as the prevalence of obesity C1 (6.6%, 7.8%,  $p \leq 0.05$ ), C2 (6.0%, 10.0%,  $p \leq 0.001$ ) and C3 (9.9%, 11.7 %,  $p \leq 0.05$ ) (boys and girls respectively).

**Conclusion:** Nutritional status showed differences, revealing an inconsistency in the quantification of eutrophic, overweight and obese. The diagnosis of nutritional status in children and adolescents has generated different classifications, due to investigations in different ethnic groups which suggest caution when classifications of nutritional status are concerned.

## REFERENCES

1. Center of Disease Control and Prevention – CDC [homepage on the Internet]. New growth charts 2000 Disponível no site <http://www.cdc.gov/growthcharts>. Acessado em 26 de mai de 2012
2. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;320:1240-3.
3. Conde WL, Monteiro CA. Body mass index cutoff points for evaluation of nutritional status in Brazilian children and adolescents. *J Pediatr (Rio J)* 2006;82:266-72.

I.C.: Integrated Faculties of North Mine - Funorte. Brazil & University of Tras-os-Montes and Alto Douro, UTAD. Portugal.

R.S.: Integrated Faculties of North Mine - Funorte, & State University of Montes Claros - Unimontes, Brazil.

F.A., V.R.: University of Tras-os-Montes and Alto Douro, UTAD. Portugal.

A.C.: University of Tras-os-Montes and Alto Douro, UTAD. Portugal & State University of Montes Claros - Unimontes, Brazil.

## Assessment of Anthropometry and Body Fat Percentage in School Children in the Brazilian City of Montes Claros

Igor CRUZ, Edelvan ROCHA, Wellington SOARES, André CARNEIRO, Victor REIS

**Objective:** To evaluate the body fat percentage of school children in the Brazilian city of Montes Claros.

**Methods:** This study is a descriptive cross-sectional study involving 382 school children being 151 boys (12,98±1,74 years) and 231 girls (12,56±1,65 years). The height (H) was measured by a fixed stadiometer (Sanny, Brazil) with the individuals in a standing position and after a deep breath, with accuracy of 0.1m, body mass (BM) was measured with a digital scale (Plenna, Brazil) with an accuracy of 100 grams. The formula  $BM/H^2$  was applied to define the Body Mass Index (BMI). The skinfolds (SK) were measured using a skinfold caliper (Cescorf) with a precision of 0.1 mm. Body composition comprised of the following SK: triceps (TR) and subscapular (SE) calculating the average of three evaluations referred elsewhere (Slaughter et al., 1984) and their classification followed the criteria proposed by Lohman (1987).

**Results:** The school children had an H: 1,56±0,11; 1,54±0,88 meters, BM: 49,34±14,39; 49,48±12,93 kg, resulting in a BMI of 19,73±4,13; 20,58±4,40  $kg/m^2$  (for boys and girls respectively), being all values suitable for age according to the CDC (2000). The school children were classified according to the body fat percentage as very low (4,0%, 4,3%), low (41,1%, 10,8%), normal (17,9%, 34,6%), moderately high (16,6%, 26,4%), high (7,9%, 19,0%) and very high (12,6%, 4,8%) (boys and girls respectively).

**Conclusion:** results showed low level of body fat percentage in boys whereas girls presented normal levels. Results also suggest the high prevalence of obesity in boys.

## REFERENCES

1. Center of Disease Control and Prevention – CDC [homepage on the Internet]. New growth charts 2000 Disponível no site <http://www.cdc.gov/growthcharts>. Acessado em 26 de mai de 2012
2. Slaughter MH, Lohman TG, Boileau RA, Horwill CA, Stillman RJ, Van loan MD et al. Skinfold e equations for esmation of body fatness in children and yonth. *Human Biology*, 60(5), 709-723, 1988.
3. Lohman TG, Roche AE, Martorell R. Anthropometric standardization reference manual. Illinois: Human Kinetics Books; 1988.

I.C.: Integrated Faculties of North Mine - Funorte, Brazil & University of Tras-os-Montes and Alto Douro, UTAD. Portugal.

E.R.: Integrated Faculties of North Mine - Funorte, Brazil.

W.S.: Integrated Faculties of North Mine - Funorte, Brazil & University of Tras-os-Montes and Alto Douro, UTAD. Portugal & State University of Montes Claros - Unimontes, Brazil & Graduate Program in Health Sciences - PPGCS, Unimontes

A.C.: University of Tras-os-Montes and Alto Douro, UTAD. Portugal & State University of Montes Claros - Unimontes, Brazil.

V.R.: University of Tras-os-Montes and Alto Douro - UTAD / Portugal

## Effect of Strength Training Intensity in Blood Pressure, Heart Rate and Rate Pressure Product Response in Grade 1 Hypertensive Males

J.P. REIS, M.S. SOUZA, N. SOUSA, C. ABRANTES.

**Objective:** The strength training (ST) effect on blood pressure (BP), heart rate (HR) and rate pressure product (RPP) is related to exercise characteristics. The objective of this study was to compare the cardiovascular response to ST sessions at 50% (ST-50) and 75% (ST-75) of 1 maximum repetition estimated (1-MRE) in hypertensive grade 1 males.

**Methods:** Fourteen hypertensive grade 1 males were divided in

two groups, with experience (TG) in ST (TG, n = 7 exercise practice > 6 month; age 31.4 ± 2.6 years; weight 87.1 ± 9.5 Kg; height 178.7 ± 6.4 cm; BP 144.3 ± 5.3 e 90.0 ± 0,0 mm.Hg<sup>-1</sup>) and no experience (NTG, n = 7; age 29.3 ± 3.0 years; weight 80.1 ± 7.7 Kg; height 175.9 ± 6.7 cm; BP 142.9 ± 4.9 e 82.9 ± 4.9 mm.Hg<sup>-1</sup>). They had two familiarization weeks with a ST program of 8 exercises: lateral pull down (LP); seated row (SR); bench press (BP); vertical row (VR), leg press (LP), leg extension (LE), leg curl (LC) and abdominal crunch (AC) and after that, 2 protocols at ST-50 and ST-75 of 1-MRE were done interspersed by 48 hours and in a randomize way. The ST-50 session was composed by 3 sets of 12 repetitions, with 120s between sets and 2,6s per movement cycle. In ST-75 the previous protocol was respected, but with 8 repetitions with 4s per cycle. The HR, BP and RPP were evaluated at the end of the last set of each exercise with a HR monitor (S510 Polar®, Finland) and with an aneroid device (Tycos®, EUA).

**Results:** The pair sample T-test did not identify differences in systolic BP between the 8 exercises in TG but the AC exercise was different ( $p = 0.05$ ) in the NTG. In diastolic BP there were no differences between TF-50 and TF-75 in both groups. In the RPP response, the LP ( $p = 0.04$ ) and SR ( $p = 0.01$ ) were different in TG and the VR ( $p = 0.04$ ), FP ( $p = 0.04$ ) and AC ( $p = 0.02$ ) in NTG. The HR in TG was different in all exercises with exception of LP, LE and LC ( $p > 0.05$ ), and in NTG the LP ( $p = 0.03$ ), VR ( $p = 0.03$ ) and AC ( $p = 0.01$ ) were different.

**Conclusions:** The BP response to 50% and 75% of 1-MRE is identical in hypertensive grade 1 with and without ST experience. However, the HR and RPP response is higher in several exercises at 75% of 1-MRE.

J.P.R.: Universidade de Trás-os-Montes e Alto Douro, Portugal.

M.S.S.: Laboratório de Esforço Resistido, Universidade do Estado do Pará, Brasil.

N.S., C.A.: Universidade de Trás-os-Montes e Alto Douro, & Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano (CIDESD), Portugal.

## Effect of Strength Training Intensity on 24 Hours Ambulatory Blood Pressure After Exercise in Hypertensive Males

J.P. REIS, M.S. SOUZA, R. MENDES, C. ABRANTES.

**Objective:** The blood pressure response after exercise can be affected by exercise characteristics and dose. The aim of this study was evaluate the BP response on 24 hours after a strength training (ST) session of 50% (ST-50) and 75% (ST-75) of 1 maximum repetition estimated (1-MRE) in hypertensive grade 1 subjects.

**Methods:** Fourteen hypertensive grade 1 males were divided in two groups, with experience (TG) in ST (TG, n = 7 exercise practice > 6 month; age 31.4 ± 2.6 years; weight 87.1 ± 9.5 Kg; height 178.7 ± 6.4 cm; BP 144.3 ± 5.3 and 90.0 ± 0.0 mm.Hg<sup>-1</sup>) and no experience (NTG, n = 7; age 29.3 ± 3.0 years; weight 80.1 ± 7.7 Kg; height 175.9 ± 6.7 cm; BP 142.9 ± 4.9 e 82.9 ± 4.9 mm.Hg<sup>-1</sup>). The participants had two familiarization weeks with ST program of 8 exercises: lateral pull down (LP); seated row (SR); bench press (BP); vertical row (VR), leg press (LP), leg extension (LE), leg curl (LC) e abdominal crunch (AC) and after that the participants have done 3 protocols ST-50, ST-75 of 1-MRE and a control (CON) in-

terspersed by an interval of 48 hours and in a randomize way. The ST-50 session was composed by 3 sets of 12 repetitions, with 120s between series and 2,6s per cycle of movement. In ST-75 the previous protocol was respected, but with 8 repetitions with 4s per cycle, in CON session no exercise was made. The systolic (SBP) and diastolic (DBP) blood pressure response in 24 hours after ST was measured by ambulatory Dyna-MAPA (Cardio Systems, Brasil) device.

**Results:** The ANOVA reveal that the 24 hours response after ST was different ( $F = 8.7 p = 0.01$ ;  $\eta^2 = 0.59$  and  $F = 177.981 p = 0.01$ ;  $\eta^2 = 0.52$ ; for SBP and DBP respectively) in TG and also in NTG ( $F = 53.2 p = 0.01$ ;  $\eta^2 = 0.89$  and  $F = 24.7 p = 0.01$ ;  $\eta^2 = 0.81$ ; for SBP and DBP respectively). In TG, the ST-50 promoted a higher reduction in relation to ST-75 in SBP ( $p = 0.02$ ), and in relation to CON in SBP ( $p = 0,03$ ) and DBP ( $p = 0.03$ ). In NTG the ST-50 response was more emphasised than in ST-75, also in the CON for SBP ( $p = 0.01$ ) and DBP ( $p = 0.01$ ).

### Conclusions

The ST with loads at 50% and 75% of 1-MRE promotes a substantial reduction in SBP and DBP during 24 hours after exercise. The ST-50 was more effective in BP reduction after exercise.

J.P.R.: Universidade de Trás-os-Montes e Alto Douro, Portugal.

M.S.S.: Laboratório de Esforço Resistido, Universidade do Estado do Pará, Brasil.

R.M.: Universidade da Beira Interior & Universidade de Trás-os-Montes e Alto Douro, Portugal.

C.A.: Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano (CIDESD), & Universidade de Trás-os-Montes e Alto Douro, Portugal.

## Is Isokinetic Conventional Ratio "Hcc:Qcc" a Good Indicator of Injury Risk?

Alberto CARVALHO, Eduardo ABADE, Carlos CARVALHO, Paulo MOURÃO.

**Introduction:** The use of Isokinetic dynamometers to evaluate muscle function has increased in sport. Conventional ratio (CR) (Hamstring concentric: Quadriceps concentric, 'Hcc:Qcc') is a parameter used to describe the muscle strength properties<sup>1</sup> and has become important in detecting injury risk whenever the value sets lower than 60%.<sup>2</sup> However, this ratio could mislead one to think that the strength capacity of the subject is enough, when in fact, it's not, because the knee joint movement only allows hamstring eccentric contraction with quadriceps concentric contraction.<sup>3</sup> This relationship (Hamstrings eccentric:Quadriceps concentric "Hec:Qcc") is known as functional ratio (FR) and 100% should be the reference value.<sup>1,3,4</sup> The aim of our study was to analyze both ratios: CR and the FR.

**Methods** After a warm-up 24 subjects performed 5 concentric (Cc) contractions and 5 eccentric (Ec) contractions at 60°s<sup>-1</sup>, using isokinetic dynamometer to evaluate the knee muscles. Mean and standard deviation were calculated. The subjects were divided in 2 groups, based on CR values: G<sub>1</sub>: CR<0,5; G<sub>2</sub>: CR>0,5.

**Results:** Presented on Table 1

**Conclusions:** The results suggested that if we only look to the CR values, we may compromise the integrity of the knee joint, because FR shows us that the "braking" action of the H is not equal of the Q maximal strength. We concluded that CR isn't a good indicator of

Table 1 - Mean, Standard Deviation of CR and FR

	Left		Right	
	G <sub>1</sub> [x ± SD]	G <sub>2</sub> [x ± SD]	G <sub>1</sub> [x ± SD]	G <sub>2</sub> [x ± SD]
CR	0.47 ± 0.02	0.62 ± 0.07	0.45 ± 0.02	0.57 ± 0.07
FR	0.64 ± 0.13	0.76 ± 0.09	0.66 ± 0.08	0.78 ± 0.15

injury risk and FR could be a more valid one.

## REFERENCES

1. Dvir, Z., *Isokinetics: Muscle Testing, Interpretation, and Clinical Applications*. Second ed. 2004, London: Churchill Livingstone.
2. Osternig, L.R., et al., *Influence of Torque and Limb Speed on Power Production in Isokinetic Exercise*. American Journal of Physical Medicine, 1983. 62(4): p. 163-171.
3. Aagaard, P., et al., *A New Concept For Isokinetic Hamstring - Quadriceps Muscle Strength Ratio*. The American Journal of Sports Medicine, 1998. 26(2): p. 231-237.
4. Impellizzeri, F.M., et al., *Reliability of isokinetic strength imbalance ratios measured using the Cybex NORM dynamometer*. Clinical Physiology and Functional Imaging, 2008. 28(2): p. 113-119.

A.C., E.A., C.C., P.M.: Higher Education Institute of Maia (ISMAI), & Research Center in Sports, Health Sciences and Human Development (CIDESD). Portugal.

## Effectiveness of a Neuromuscular and Proprioceptive Combination Training Program in Preventing Injuries in Youth Soccer Players

Paulo MOURÃO, David MARTINS, Francisco GONÇALVES, Eduardo ABADE, Alberto CARVALHO, João VIANA.

**Introduction:** Soccer is associated with a relatively high injury rate.

<sup>1</sup> Given that most soccer injuries occur in the lower extremities,<sup>2</sup> many preventive programs have been focused on proprioceptive and neuromuscular training with balance boards.<sup>3</sup> However, when such equipment is not available, professionals have to seek other solutions. Therefore, the aim of this study was to evaluate the effectiveness of a neuromuscular and proprioceptive training program in preventing lower extremities injuries in youth soccer players.

**Methods:** Twelve male soccer players (18.7 ± 0.5 yrs; 177.8 ± 6.5 cm; 71.8 ± 6.1 kg) participated in this study over the entire season; during the first half of the season subjects performed their usual training program (control) while during the second half of the season subjects additionally performed an experimental injury prevention training program without unstable boards every weekday (4 sets of 15 seconds of balance training and 4 sets of 10 reps of specific neuromuscular training, which consisted of front-back and left-right quick hops). Injury incidence and length of injury absence were recorded during both periods and differences were examined using Wilcoxon signed-rank tests.

**Results:** Injury incidence tended to be lower during the experimental period in comparison to the control period (2.6 ± 6.1 vs. 11.4 ± 20.1 injuries per 1000 hours;  $P = 0.050$ ). Length of injury absence was also lower during the experimental period (0.8 ± 1.9 vs. 12.7 ± 20.1 days;  $P = 0.024$ ).

**Conclusion:** These findings suggest that a neuromuscular and

proprioceptive training program without balance boards may be an effective injury prevention strategy in youth soccer players.

## REFERENCES

1. Walden et al. Br J Sports Med, 2005. 39: 542-6.
2. Hawkins & Fuller. Br J Sports Med, 1999. 33:196-203.
3. Vathrakokilis et al. J Back Musculoskelet, 2008. 21: 233-7.

P.M., D.M.: Higher Education Institute of Maia (ISMAI). Portugal.  
F.G.: University of Trás-os-Montes and Alto Douro (UTAD); & Research Center in Sports, Health Sciences and Human Development (CIDESD). Portugal.

E.A.: Higher Education Institute of Maia (ISMAI); & University of Trás-os-Montes and Alto Douro (UTAD); & Research Center in Sports, Health Sciences and Human Development (CIDESD). Portugal.

A.C.: Higher Education Institute of Maia (ISMAI); & Research Center in Sports, Health Sciences and Human Development (CIDESD). Portugal.

J.V.: Higher Education Institute of Maia (ISMAI); & University of Beira Interior (UBI); & Research Center in Sports, Health Sciences and Human Development (CIDESD). Portugal.

## The Role of Growth Factors in Skeletal Muscles Regeneration

Anna KASPERSKA, Joanna OSTAPIUK-KAROLCZUK, Piotr ZUREK, Ryszard WOLNY, Elzbieta HUBNER-WOZNIAK, Agnieszka ZEMBRON-LACNY.

**Introduction:** The growth factors play a key role in regeneration and reorganization of injured skeletal muscles. They are released from muscles, motor nerves, endothelial and immune cells in response to hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and nitric oxide (NO) generation during exercise and/or recovery phase (Zembron-Lacny et al. 2012). The study was designed to observe the effect of regular exercise on growth factors level and relation to skeletal muscle damage and body composition.

**Methods:** Sixteen elite Greco-Roman wrestlers in preparatory period (pre-season, January) as well as twenty healthy untrained men participated in the study. In blood samples, H<sub>2</sub>O<sub>2</sub>, NO, hepatocyte growth factor (HGF), insulin-like growth factor (IGF-I), platelet-derived growth factor (PDGF-BB) and brain-derived neurotrophic factor (BDNF) were determined. Total creatine kinase (CK) activity was used as a marker of muscle damage and it was measured at 3 consecutive days of training. Body composition was estimated using a bioelectrical impedance (Tanita®).

**Results:** H<sub>2</sub>O<sub>2</sub> concentration was significantly decreased whereas NO, IGF-I, PDGF-BB and BDNF were increased in wrestlers compared to non-athletes. NO strongly correlated with BDNF concentration ( $r = 0.641$   $P < 0.001$ ). CK activity was 4-9-fold elevated in wrestlers. The decline in CK activity after intense training was faster in athletes with high values of IGF-I, PDGF-BB and BDNF. Between %CK changes and IGF-I concentration the negative correlation ( $r = -0.755$   $P < 0.001$ ) was observed. Free fat mass (FFM) was higher in wrestlers than non-athletes but not correlated with

any growth factors.

**Conclusions:** Wrestling training at high intensity has significant influence on level of muscle damage and growth factors. The measurement of growth factors concentration could be useful in assessment of muscle regeneration in athletes.

**Acknowledgments:** This study was supported by a grant from National Science Centre Poland: 2011/01/N/NZ7/05282.

## REFERENCES

1. Zembron-Lacny et al. (2012). *Ortop Traumatol Rehabil* 2012; 14(1): 1-11.

A.K., J.O-K, P.Z., A.Z-L.: Faculty of Physical Culture Gorzow Wlkp., University of Physical Education Poznan. Poland.

R.W.: Polish Wrestling Federation.

E.H-W.: University of Physical Education Warsaw. Poland.

## Exploratory Phase of Implementation of AD-HOC Tool for Assessment of Aquatic Readiness of Babies

Liliana OLIVEIRA, Rui RESENDE, Tiago FIGUEIREDO, Nuno GARRIDO, Ágata ARANHA.

**Introduction:** Drowning is the second cause of accidental death in children between 1-14 years (APSI, 2011). According to Bernner et al. (2009) participation in swimming lessons is associated with an 88% reduction in risk of drowning in 1-4 years old children.

**Objective:** The purpose of this study was to develop a capable tool to assessing the aquatic readiness.

**Methods:** A pilot study was conducted in order to register the motor skills acquired by training in the aquatic environment, which represent an increased risk of drowning in infants. Data were recorded

on video during 40 learning sessions (once a week) of three infants aged between 18 and 36 months.

**Results:** We found that infants at the end of the study performed the respiratory control in the aquatic environment in situations such as displacements, jumps, voluntary dives, and there was an increase in immersion time. When placed in the dorsal position for a few seconds infants remained floating, doing the rotation to the prone position as well as the opposite. In combination skills, babies started moving the upper and lower limbs in order to reach fixed points, or return to the starting point after jumping into the water.

**Conclusions:** We conclude that children aged 18 to 36 months can develop aquatic motor skills through basic survival training. The skills were acquired in a progressive way and accelerated the process from the moment that babies acquired a horizontal body position. Finally, results suggest that the skills acquired through training are indicators of drowning prevention, since it is considered that infants between 18 and 36 months are able to successfully perform the proposed indicators on the instrument, having a good chance of surviving in case of accidentally dropped in water.

## REFERENCES

1. APSI. (2011). Afogamentos em crianças e jovens até aos 18 anos em Portugal Retrieved 6 de junho, 2012.
2. Brenner, R. A., Taneja, G. S., Haynie, D. L., Trumble, A. C., Qian, C., Klinger, R. M., & Klebanoff, M. A. (2009). Association between swimming lessons and drowning in childhood. *Archives of Pediatric and Adolescent Medicine*, 163(3), 203-210.

L.O., N.G., Á.A.: University of Tras-os-Montes and Alto Douro, UTAD. & Research Center in Sports, Health Sciences and Human Development – CIDESD. Portugal.

R.R.: Research Center in Sports, Health Sciences and Human Development – CIDESD. Portugal.

T.F.: Superior Institute of Maia - ISMAI. Portugal. & University Gama Filho – UGF / Brazil.

