

# cidesd 2014

INTERNATIONAL CONGRESS OF

**EXERCISE AND SPORTS PERFORMANCE**

# abstracts book

**POLYTECHNIC OF GUARDA**

**PORTUGAL**

ABSTRACTS BOOK OF THE

# cidesd 2014

INTERNATIONAL CONGRESS OF EXERCISE AND  
SPORTS PERFORMANCE

CHAIRS OF THE ORGANIZING COMMITTEE  
CAROLINA VILA-CHĂ, MÁRIO COSTA, PEDRO ESTEVES



POLYTECHNIC INSTITUTE OF GUARDA  
PORTUGAL

14-15 NOVEMBER 2014

Copyright The Authors, 2014. All Rights Reserved.

No reproduction, copy or transmission may be made without written permission from the individual authors.

Papers have been submitted to peer reviewed process before final submission to the congress. Many thanks to the reviewers who helped ensure the quality of the manuscripts.

Further copies of this book can be accessed from <http://www.ipg.pt/cidesd2014/>

**Editors**

Carolina Vila-Chã

Mário Costa

Pedro Esteves

**Graphic Editor**

Diogo Chouzal

**Published by Polytechnic Institute of Guarda**

Av. Dr. Francisco Sá Carneiro, n.º 50

6300-559 Guarda

Portugal

# CONTENTS

PREFACE .....	v
MENSAGEM CIDESD.....	v
MENSAGEM IPG.....	vi
COMMITTEES.....	vii
SCIENTIFIC.....	vii

## **CreativeLab**

10. UNDERSTANDING OFFENSIVE PATTERNS OF PERFORMANCE OF FUTSAL TOP LEVEL NATIONAL TEAMS .....	2
22. FOOTBALLERS' MOVEMENT BEHAVIOUR WHEN PLAYING SMALL-SIDED GAMES MANIPULATING THE NUMBER OF OPPONENTS AND TEAMMATES .....	3
25. THE INFLUENCE OF EARLY SPORT INVOLVEMENT IN A BASKETBALL ENRICHMENT TRAINING PROGRAM .....	4
26. PERFORMANCE AND VARIABILITY PROFILES IN COMPETITION OF NBA PLAYERS: COMPARING BETWEEN ALL-STAR AND NON-ALL-STAR PLAYERS .....	5
30. TYPICAL WEEKLY WORKLOAD OF UNDER-15, UNDER-17 AND UNDER-19 ELITE PORTUGUESE FOOTBALL PLAYERS .....	6
33. EFFECTS OF USING BALLS FROM OTHER SPORTS ON EXTERNAL WORKLOAD OF PLAYERS DURING FOOTBALL SMALL-SIDED GAMES .....	7
34. THE EFFECT OF TEAM TIMEOUT ON THE PERFORMANCE INDICATORS IN HANDBALL MATCH ACCORDING TO THE COMPETITIVE CONTEXT.....	8
43. QUANTITATIVE ANALYSIS OF LEADER-FOLLOWER INTERACTIONS BETWEEN FOOTBALL PLAYERS .....	9
47. EFFECTS OF GOAL MANIPULATION AND AGE LEVEL ON PLAYERS PERFORMANCE IN FUTSAL.....	10
52. THE CHANGING RULE EFFECT ON BASKETBALL PERFORMANCE .....	11
54. INDIVIDUAL AND COLLECTIVE CREATIVITY IN YOUNG FOOTBALLERS .....	12
59. THE ACQUISITION OF AQUATIC SKILLS IN PRESCHOOL CHILDREN VARIES ACCORDING TO THE WATER DEEP ENVIRONMENT DURING SWIMMING LESSONS .....	13
66. A ANÁLISE DINÂMICA DAS REDES NO FUTEBOL: CONTRIBUTO PARA A DETERMINAÇÃO DA INFLUÊNCIA INDIVIDUAL DOS JOGADORES .....	14
67. PHYSICAL AND TACTICAL PERFORMANCE OF ELITE FOOTBALLERS DURING THE PRESEASON .....	15
69. SOCCER ANALYSIS OF THE INTERNATIONAL MILAN LONG TERM ATTACK THAT END SUCCESSFULLY.....	16
71. HOW GAME PHASE AFFECTS THE TYPE OF SET USED BY U19, U21 AND SENIOR MALE BEACH VOLLEYBALL PLAYERS .....	17
73. TEAM PERFORMANCE ACCORDING TO BALL POSSESSION CHARACTERISTICS: A SOCIAL NETWORKS APPROACH .....	18
83. THE EFFECT OF PERFORMANCE INDICATORS ON THE TIME OF THE FIRST GOAL SCORING IN THE FOOTBALL MATCH .....	19
84. TIME-MOTION ANALYSIS IN YOUTH ELITE RUGBY PLAYERS DURING GAME TRAINING .....	20
85. EXEMPLOS DE PRODUÇÃO DE MATERIAL DESPORTIVO ADAPTADO À INCLUSÃO DE ALUNOS COM DEFICIÊNCIA VISUAL.....	21
91. GAME ANALYSIS IN THE ERA OF BIG DATA: A SOCIAL NETWORKS APPROACH .....	22

## **STRONG**

1. EFFECT OF TRAINING AND EXERCISE INTENSITY ON INDICES OF OXIDATIVE BALANCE .....	24
4. INFANTS' PHYSIOLOGICAL RESPONSE TO FOUR MONTHS OF A SWIMMING PROGRAM .....	25
6. MODELING PERFORMANCE AND BIOMECHANICS IN YOUNG SWIMMERS .....	26
8. MAGNESIUM AND PHASE ANGLE: A PROGNOSTIC TOOL IN CELLULAR INTEGRITY OF JUDO ATHLETES .....	27

9. 2000m ALL-OUT AND TIME SUSTAINED AT 100% OF VO2MAX INTENSITY IN ROWING ERGOMETER EXERCISE .....	28
24. POST WARM-UP RECOVERY AND PERFORMANCE IN SWIMMING .....	29
31. PÉRDIDA DE FUERZA DINÁMICA MÁXIMA TRAS UNA ACCIÓN EXCÉNTRICA .....	30
38. RELIABILITY AND CONSTRUCT VALIDITY OF YO-YO INTERMITTENT TESTS IN UNTRAINED AND FOOTBALL TRAINED PUPILS .....	31
39. EXCELLENCE IN ORIENTEERING: REPRESENTATION FROM ELITE COACHES .....	32
42. EFEITOS DE UM PROGRAMA DE TREINO DE FORÇA EXCÊNTRICO VS CONCÊNTRICO NA FORÇA, EQUILÍBRIO MUSCULAR DOS ROTADORES DOS OMBROS E VELOCIDADE DE REMATE EM JOVENS ANDEBOLISTAS.....	33
44. SEASONAL ADAPTATIONS IN THE PHYSICAL PERFORMANCE OF FUTSAL PLAYERS AND ITS EFFECTS ON DEFENSIVE SKILLS .....	34
45. THE EFFECT OF THE APPLICATION OF A PHYSICAL FITNESS PROGRAM BEFORE AND AFTER TECHNICAL/TACTICAL WORK IN TEAM SPORTS IN PHYSICAL EDUCATION.....	35
46. INFLUENCE OF STRENGTH, SPRINT RUNNING, AND COMBINED STRENGTH AND SPRINT RUNNING TRAINING ON SHORT SPRINT PERFORMANCE IN YOUNG ADULTS .....	36
48. POWER ASSESSMENT IN YOUNG MALE SOCCER GOALKEEPERS: VARIATION BY COMPETITIVE LEVEL .....	37
53. ELECTROMYOGRAPHY IN SWIMMING PERFORMANCE: A REVIEW .....	38
55. ASSESSMENT OF ANAEROBIC PERFORMANCE IN YOUNG SWIMMERS USING LABORATORY AND SPORT SPECIFIC TESTS .....	39
58. CORTISOL, TESTOSTERONE AND MOOD STATE VARIATION DURING AN OFFICIAL FEMALE FOOTBALL COMPETITION .....	40
60. ANAEROBIC ENERGY RELEASE DURING VARIOUS RESISTANCE EXERCISES PERFORMED AT 80% 1-RM .....	41
61. INCREMENTO DA FORÇA E DA POTÊNCIA MUSCULAR NO CONTEXTO DAS AULAS DE EDUCAÇÃO FÍSICA.....	42
62. EFEITO DA APLICAÇÃO DE UM PROGRAMA DE TREINO DE FORÇA NAS AULAS DE EDUCAÇÃO FÍSICA.....	43
63. MAXIMAL OXYGEN UPTAKE IN PROFESSIONAL FOOTBALL PLAYERS: COMPARISON BETWEEN LEVELS AND PLAYING POSITIONS .....	44
65. COMPARISON OF THE HAMSTRING/QUADRICEPS RATIOS FOR THE ASSESSMENT OF MUSCLE BALANCE IN FOOTBALL PLAYERS OF FIRST AND SECOND PORTUGUESE LEAGUES .....	45
68. FOOTBALL ANALYSIS OF THE INTERNATIONAL MILAN LONG TERM ATTACK THAT END SUCCESSFULLY.....	46
70. POST-ACTIVATION POTENTIATION AFTER A CONDITIONAL CONTRACTION.....	47
72. SPORT TRAJECTORIES AND INVOLVEMENT OF PORTUGUESE OLYMPIC RISING STARS.....	48
75. EFECTOS DEL ENTRENAMIENTO INTERVÁLICO DE ALTA INTENSIDAD SOBRE ACCIONES EXPLOSIVAS EN JÓVENES JUGADORES DE BALONMANO.....	49
76. SPATIO-TEMPORAL COORDINATION IN FRONT CRAWL AT DIFFERENT INTENSITIES - A CASE STUDY .....	50
77. ENERGY SYSTEM CONTRIBUTION DURING 100 M FRONT CRAWL SWIMMING .....	51
78. CARACTERIZAÇÃO DO DÉFICIT DE OXIGÉNIO NO DOMÍNIO DA INTENSIDADE SEVERA NO NADO CRAWL-AMARRADO .....	52
80. THE EFFECT OF DIFERENT WARM-UP IN HANDBALL: TERMOGRAPHY ANALYSIS.....	53
90. FLEXIBILITY METHODS EFFECT IN EXPLOSIVE STRENGTH IN GYMNASTICS/TEAMGYM.....	54

## **GERON**

5. ATIVIDADE FÍSICA E ESTADO NUTRICIONAL NO PROCESSO DE ENVELHECIMENTO .....	56
7. PREDIÇÃO DE DESVIOS POSTURAIIS A PARTIR DO GRAU DE ASSOCIAÇÃO ENTRE ASSIMETRIAS POSTURAIIS EM CRIANÇAS E JOVENS FUTEBOLISTAS .....	57
12.TREINO MULTICOMPONENTE EM IDOSOS ATIVOS: EFEITOS DE UMA SESSÃO DE TREINO DE FORÇA COMPLEMENTAR NA APTIDÃO MUSCULAR, FUNCIONAL E SUA RETENÇÃO APÓS CESSAÇÃO .....	58
13. OBESITY, MUSCLE STRENGTH AND CARDIORESPIRATORY FITNESS IN THE ELDERLY.....	59
14. EXERCISE AND PERCEIVED HEALTH STATUS IN THE ELDERLY: DIFFERENT SOCIAL AND BEHAVIORAL CONTEXTS.....	60
20. INFLUENCE OF PHYSICAL ACTIVITY ON MUSCLE STRENGTH AND CARDIORESPIRATORY FITNESS IN OBESE ELDERLY: A COMPARISON WITH SEPTUAGENARIANS, OCTOGENARIANS AND NONAGENARIANS.....	61
21. MARRIED COUPLE CONCORDANCE IN MENTAL PERCEPTION AND PHYSICAL FITNESS .....	62
23. INCLUSÃO NO DESPORTO: PERCEÇÃO DO AUTOCONCEITO EM ADOLESCENTES INSTITUCIONALIZADAS NA CIDADE DE BRAGANÇA.....	63

27. OBESIDAD INFANTIL Y PARÁMETROS DE COMPOSICIÓN CORPORAL EN NIÑOS DE EXTREMADURA (ESPAÑA) .....	64
29. EVALUACION DE LA SARCOPENIA EM SUPERVIVIENTES DE CANCER .....	65
32. ADEQUABILIDADE DE DOIS TESTES ABDOMINAIS E A RELAÇÃO DESTES COM A FLEXIBILIDADE E VARIÁVEIS ANTROPOMÉTRICAS EM MULHERES MAIORES DE 55 ANOS .....	66
35. NÍVEIS DE ATIVIDADE FÍSICA EM ADOLESCENTES. A INFLUÊNCIA DOS AMIGOS .....	67
37. INCREASED PHYSICAL ACTIVITY AND FITNESS ABOVE THE 50TH PERCENTILE PREVENTS THE INSTITUTIONALIZATION OF ELDERLY PEOPLE: A CROSS-SECTIONAL PILOT STUDY .....	68
40. ANÁLISE DOS BENEFÍCIOS DO PROGRAMA DE REABILITAÇÃO FUNCIONAL UTILIZADO NA UNIDADE DE CUIDADOS CONTINUADOS DE MÉDIA DURAÇÃO DE ARRONCHES EM PESSOAS IDOSAS COM FRACTURA DO COLO FÉMUR .....	69
49. CONTRIBUTO DA DIDÁTICA DA DANÇA PARA A SATISFAÇÃO DE PRATICANTES IDOSAS .....	70
50. ISOKINETICS STRENGTH RELATION WITH FEAR OF FALL, FALLS AND PHYSICAL ACTIVITY LEVEL IN ELDERLY WOMEN .....	71
51. EFEITO DAS ATIVIDADES DE ENRIQUECIMENTO EXTRACURRICULAR (AEC) NA APTIDÃO FÍSICA DE CRIANÇAS PRÉ-PUBERTÁRIAS: UM ESTUDO PILOTO .....	72
56. EFECTOS DEL ENTRENAMIENTO INTERVÁLICO DE ALTA INTENSIDAD SOBRE LA COMPOSICIÓN CORPORAL DE PREADOLESCENTES .....	73
57. DISEÑO DE UN PROGRAMA DE INTERVENCIÓN FÍSICA E INTERVENCIÓN PSICOLÓGICA EN PACIENTES CON CÁNCER DE MAMA METASTÁSICO .....	74
64. A MULHER OBESA E A PRÁTICA DESPORTIVA APÓS CIRURGIA POR OBESIDADE .....	75
74. OS EFEITOS DA ATIVIDADE FÍSICA DIÁRIA NA APTIDÃO FUNCIONAL, FORÇA E COMPOSIÇÃO CORPORAL DE IDOSAS DA COMUNIDADE DE BRAGANÇA .....	76
79. EFFECTS OF A PHYSICAL FITNESS PROGRAM IN THE FUNCTIONAL AUTONOMY AND SATISFACTION WITH LIFE ON ELDERLY MEN .....	77
81. A ATIVIDADE FÍSICA COMO INDICADOR DE RISCO DA PERIODONTITE. REVISÃO NARRATIVA .....	78
82. PLAYING SPORTS OUT OF THE SCHOOL: AN INTERVENTION STUDY WITH THREE PUPILS WITH EXCESSIVE WEIGHT .....	79
86. IS IT POSSIBLE TO DEVELOP PUPIL'S STRENGTH DURING PHYSICAL EDUCATION CLASSES? .....	80
87. EXERCICIO FISICO E APTIDÃO FISICA-FUNCIONAL EM IDOSOS: UM ESTUDO COM PARTICIPANTES DO PROGRAMA ATIVIDADE SÉNIOR EM VISEU .....	81
89. A APTIDÃO FÍSICA DE IDOSOS INSTITUCIONALIZADOS E A PRÁTICA DE ATIVIDADE FÍSICA .....	82

# PREFACE

## MENSAGEM CIDESD



O Centro de Investigação em Desporto, Saúde e Desenvolvimento (CIDESD) coorganiza, juntamente com o Instituto Politécnico da Guarda, o seu terceiro congresso internacional de exercício e performance desportiva nos dias 14 e 15 de Novembro de 2014.

O CIDESD é uma unidade de investigação e desenvolvimento organizada num consórcio de oito instituições de ensino distribuídas geograficamente por todo o país (Escola Superior de Desporto de Rio Maior, Instituto Politécnico de Bragança, Instituto Politécnico de Viseu, Instituto Superior da Maia, Universidade da Beira Interior, Universidade de Évora, Universidade da Madeira e Universidade de Trás-os-Montes e Alto Douro). Os principais objetivos desta unidade I&D centram-se na produção de investigação científica que suporte programas educacionais de aprendizagem ao longo da vida no âmbito da Performance Desportiva e da Atividade Física, Exercício e Saúde.

Desde a sua constituição formal em 30 de Maio de 2007 que a equipa de investigação do CIDESD tem procurado alcançar uma reputação internacional sólida, como pode ser comprovado pelo frequente envolvimento na organização de eventos internacionais de referência, na participação editorial de diversas revistas científicas de impacto nacional e internacional, assim como pela participação e edição de livros de referência internacional. Aos seus membros, foram igualmente atribuídos importantes prémios/distinções pelos trabalhos desenvolvidos, frequentemente provenientes de colaborações com diversos parceiros institucionais.

A organização e gestão do CIDESD para o período de 2015-2020 foi atualizada para um formato de Comunidades e Programas de Investigação. Na atualidade, estão a funcionar três comunidades de investigação (CreativeLab, STRONG e GERON) que acolhem o desenvolvimento de vários programas em cada âmbito de intervenção. O CreativeLab está centrado no desenvolvimento de métodos que possibilitem identificar e descrever o comportamento coletivo, explorando a sua aplicação a equipas desportivas ou a outras atividades que envolvam interação social para a resolução de problemas complexos. O GERON está centrado no turismo ativo, explorando em particular o processo de envelhecimento e os efeitos da atividade física, desenvolvendo investigação que optimize a prescrição do exercício para populações especiais abrindo oportunidades para aumentar o espectro e a qualidade do mercado disponível. O STRONG está centrado no desenvolvimento de modelos de performance utilizando variáveis do âmbito da genética, biomecânica e fisiologia. É dada particular atenção ao âmbito da dinâmica computacional de fluidos, que tem permitido otimizar detalhes importantes nos modelos de rendimento desportivo.

Este terceiro congresso internacional é um evento chave do plano de desenvolvimento do CIDESD. Em primeiro lugar porque é coorganizado com o Instituto Politécnico da Guarda, instituição que, nos últimos tempos, se identificou com a missão e objetivos do CIDESD e tem demonstrado elevada capacidade de produzir e utilizar a ciência como resposta aos desafios e necessidades atuais da sociedade. Em segundo lugar, porque o programa permite criar, desenvolver ou reativar novas interações entre todos os participantes, quer sejam entre os membros integrados e colaboradores do CIDESD, quer sejam com o painel de convidados de elevado prestígio. Em terceiro lugar, porque o congresso certamente será um espaço de grande importância para a divulgação do estado da arte na investigação científica e para o início ou desenvolvimento da carreira dos nossos jovens investigadores. O facto de terem sido submetidos 83 trabalhos originais ao comité científico do congresso, bem distribuídos pelas três comunidades de investigação, é uma demonstração inequívoca do interesse pelas atividades do centro e um prenúncio de um evento que certamente terá a qualidade que se espera. Obrigado a todos por contribuírem para o desenvolvimento deste projeto coletivo.

Prof. Doutor Jaime Sampaio  
(Diretor do CIDESD)

## Uma marca de qualidade e sucesso

A realização, no Instituto Politécnico da Guarda, do Congresso Internacional de Exercício e Performance Desportiva ficará, certamente, assinalada nas páginas do historial da nossa instituição.

Apresentado como um espaço de confluência entre académicos, treinadores e atletas, com o objetivo de gerar eminentes interações científicas, enquanto plataforma para intervenções mais qualificadas ao nível da prescrição de exercício e da performance desportiva, este Congresso reforça a nossa estratégia de abertura à comunidade e a permanente preocupação de um ensino de qualidade, de excelência.

É, pois, com enorme satisfação que recebemos o CIDESD 2014, todos quantos vão intervir ou participar neste importante evento formativo e informativo, de inegável alcance pedagógico e científico. Aliás, o programa é suficientemente elucidativo do nível deste Congresso – onde pontuam insignes conferencistas, académicos, investigadores, atletas e agentes desportivos – dispensando-nos de tecer quaisquer considerações.

Contudo, queremos assinalar a importância desta cooperação do IPG com o Centro de Investigação em Ciências do Desporto, Ciências da Saúde e Desenvolvimento Humano. Temos sempre defendido um crescente diálogo e definição de parcerias com unidades de investigação, instituições ou organismos que prossigam objetivos comuns e possam enriquecer a nossa oferta formativa.

E porque estamos a falar de Desporto, não esqueçamos a marca qualitativa do IPG, reconhecida por insuspeitos testemunhos e comprovada também pela carreira e atividade profissional dos nossos diplomados; marca procurada por estudantes das mais variadas regiões do país, como se tem verificado ao longo dos anos. E o êxito dos nossos alunos continua a ser a nossa ambição.

Felicitando a Organização deste Congresso, e deixando uma cordial saudação a todos quantos vão fazer destes dois dias um período de ensino/aprendizagem e partilha de experiências, desejamos os maiores sucessos ao CIDESD 2014.

Bem-vindos ao Instituto Politécnico da Guarda!

**Prof. Doutor Constantino Rei**

Presidente do IPG

A UTC de Desporto e Expressões tem vindo a desenvolver os maiores esforços para elevar o nível de ensino e investigação associados ao curso de Licenciatura e Mestrado em Desporto.

Neste sentido, a elevada qualificação do seu corpo docente, bem como a melhoria das condições laboratoriais e espaciais inerentes ao curso são uma prova cabal desse percurso evolutivo.

O evento que agora nos reúne, pela sua grande visibilidade a nível nacional e internacional constituirá um forte contributo para a afirmação externa dos Cursos de Desporto do Instituto Politécnico da Guarda. É mais uma iniciativa, que proporcionará aos nossos docentes e estudantes, bem como aos técnicos e desportistas nacionais - e, em especial, aos da região da Guarda - o contacto com as evidências científicas mais atuais na área do exercício físico e performance desportiva.

Palavras de agradecimento são devidas aos principais obreiros deste Congresso: Prof. Doutora Carolina Vila-Chã, Prof. Doutor Mário Costa e Prof. Doutor Pedro Esteves e restantes docentes da área de Ciências do Desporto. Justa e necessária é, também, a manifestação de gratidão ao Mestre Diogo Chouzal, pela dedicação, labor e competência postos ao serviço da organização deste evento.

Boas-vindas e votos de um excelente Congresso.

**Prof. Doutor Nuno Serra**

(Coordenador da UTC de Desporto e Expressões)



# COMMITTEES

## SCIENTIFIC

Aldo Costa - UBI  
Ana Pereira - IPS  
Armando Raimundo - UEVORA  
Bruno Travassos - UBI  
Carolina Vila-Chã - IPG  
Catarina Abrantes - UTAD  
Hugo Louro - ESDRM  
Luís Cid - ESDRM  
Mário Costa - IPG  
Mário Marques - UBI  
Nuno Batalha - UEVORA  
Nuno Garrido - UTAD  
Paula Mota - UTAD  
Pedro Esteves - IPG  
Rui Marcelino - UTAD  
Susana Póvoas - ISMAI  
Tiago Barbosa - NTU  
Vítor Lopes - IPB

## ORGANIZATION

António Albino Dias - ESECD-IPG  
Bernardete Jorge - ESECD-IPG  
Jorge Casanova - ESECD-IPG  
Natalina Casanova - ESECD-IPG  
Nuno Serra - ESECD-IPG  
Teresa Fonseca - ESECD-IP



CreativeLab



# 10. UNDERSTANDING OFFENSIVE PATTERNS OF PERFORMANCE OF FUTSAL TOP LEVEL NATIONAL TEAMS

Esteves, P. T. <sup>1,2</sup>, Travassos, B.,<sup>2,3</sup> Guerra, A.,<sup>1</sup> Vieira, A.,<sup>1</sup> Cabo, M.<sup>1</sup>

<sup>1</sup> Polytechnic Institute of Guarda, UDI: Research Unit for Inland Development, Guarda, Portugal, <sup>2</sup> CIDESD: Research Center in Sports, Health Sciences and Human Development, Vila Real, Portugal; <sup>3</sup> Department of Sport Sciences, University of Beira Interior, Covilhã, Portugal

## Introduction

In the last years, sports performance analysis has benefited from an ecological dynamics rational, aimed to comprehend how patterns of coordinated behaviour arise between performers (e.g., Vilar, Araújo, Davids, & Button, 2012). Despite of recent significant contributions (Malta & Travassos, 2014), there is still a gap concerning the characterization of offensive patterns of play of futsal top level teams according to its outcome.

## Methods

Six (n=6) video recorded matches from European Futsal Championship 2014, were analysed. Offensive sequences of play were selected upon the type of outcome: i) success (goal scored) and ii) unsuccess (shot on target). In order to notate ball movements over the pitch, the Futsal pitch was divided in 14 different areas of performance. A total of 35 sequences of play (success = 12, and unsuccess = 23) were considered for network analysis (SocNeV 0.81). This software allowed to compute the following variables: i) density (%DE); ii) betweenness centrality (%BC) and iii) closeness centrality (CC%).

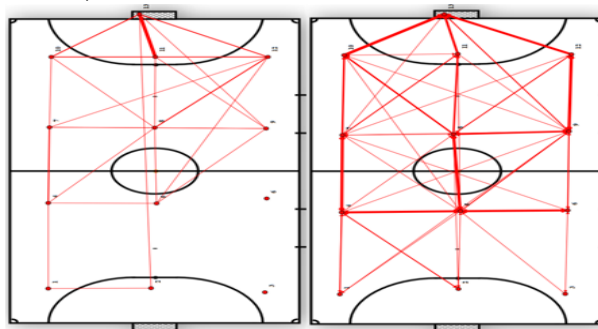
## Results

We found larger values of DE (0.35) and BC (0.39), for offensive sequences of play ending with shot on target, than for those ending with goal, respectively, DE (0.18) and BC (0.18). Interestingly, while the majority of goals were obtained from shots attempted on the center of pitch (50%), shots on target predominantly occurred on the left side of pitch (40%).

## Conclusion

Our results suggest that the outcome of the offensive sequences of play is influenced by the previous exploration of action possibilities.

**Acknowledgement:** This work was supported by Portuguese National Funding Agency for Science, Research and Technology (FCT) grant (pEst. QE/EGE/UI4056/2014)



**Figure 1:** Network representation of interpersonal links relative to sequences of play ending with goal (left panel) and shot on target (right panel).

## References

Malta, P. & Travassos, B. (2014). Characterization of the defense-attacker transition of a soccer team. *Motricidade*, 10(1), 27-37.  
Vilar, L., Araújo, D., Davids, K. & Button, C. (2012). The role of ecological dynamics in analyzing performance in team sports. *Sports Medicine*, 42(1), 1-10.

**Keywords:** Interpersonal coordination; performance analysis; action possibilities.

## 22. FOOTBALLERS' MOVEMENT BEHAVIOUR WHEN PLAYING SMALL-SIDED GAMES MANIPULATING THE NUMBER OF OPPONENTS AND TEAMMATES

Gonçalves, B.<sup>1</sup>, Marcelino, R.<sup>1</sup>, Torres-Ronda, L.<sup>2</sup>, Torres-Martín, C.<sup>2</sup>, Sampaio, J.<sup>1</sup>

<sup>1</sup> *CreativeLab, Research Center in Sports Sciences, Health Sciences and Human Development (CIDESD), Vila Real, Portugal*  
<sup>2</sup> *National Institute of Physical Education of Catalonia (INEFC), University of Lleida, Spain*

### Introduction

The design and development of adequate environments to improve tactical behaviour is still unexplored, although much focused on using constrained small-sided games (SSG) as an optimal decision-making drill (Davids, Araujo, Correia, & Vilar, 2013). Since different SSG scenarios may elicit increased variability in cognitive processing, for example, by manipulating the game pace, status or team unbalance (Sampaio, Lago, Gonçalves, Maçãs, & Leite, 2014), this study aimed to compare player positioning dynamics' when manipulating the number of opponents and teammates during professional and amateur football small-sided games.

### Methods

Twenty-two professional (age: 25.6±4.9 years; height: 180.5±4.3 cm; weight: 74.7±4.8 Kg) and twenty-two amateur (age: 23.1±0.7 years; height: 179.6±6.1 cm; weight: 72.3±5.9 Kg) male footballers participated in a cross-sectional study. The participants played three game formats (4×3, 4×5 and 4×7) and data were analysed according to the number of opponents (3, 5 and 7) and teammates (none, 2 and 4). Positional data were captured using a 15Hz non-differential global positioning system, allowing to calculate the team spatial dispersion, as measured by the distance from each player to team centroid (DC) and to the opponent team centroid (DOP). Afterwards, the time series were computed and processed with non-linear techniques (approximate entropy) and the results among the games were compared using Cohen's  $d_{unb}$  Effect Sizes with 95% Confidence Intervals.

### Results

Results from manipulating the number of opponents in professional teams' movement behaviour resulted in moderate/large differences in irregularity values to both DC (less ~10-15%) and DOP (less ~10-13%) when compared to playing against 7 opponents. The amateur results showed that with no teammates, the irregularity in both DC and DOP presented moderate/large increases.

**Conclusion:** Manipulating the number of opponents was effective to over-emphasize the need to use local information in the decision-making process; however, results suggest that amateur players' still rely on external informational feedback. Increasing the number of teammates may promote extra regularity in spatial organization to less expert teams and emphasize the players' local perception.

### References

Davids, K., Araujo, D., Correia, V., & Vilar, L. (2013). How small-sided and conditioned games enhance acquisition of movement and decision-making skills. *Exercise and Sport Sciences Reviews*, 41(3), 154-161.  
Sampaio, J., Lago, C., Gonçalves, B., Maçãs, V., & Leite, N. (2014). Effects of pacing, status and unbalance in time motion variables, heart rate and tactical behaviour when playing 5-a-side football small-sided games. *Journal of Science and Medicine in Sport*, 17(2), 229-233.

**Keywords:** Dynamics' behaviour; collective behaviour; inequality games.

## 25. THE INFLUENCE OF EARLY SPORT INVOLVEMENT IN A BASKETBALL ENRICHMENT TRAINING PROGRAM

Sara Santos<sup>1</sup>, Nuno Leite<sup>1</sup>, Nuno Mateus<sup>1</sup>, Jaime Sampaio<sup>1</sup>

<sup>1</sup>*CreativeLab, Research Center in Sport Sciences, Health and Human Development, University of Trás-os-Montes and Alto Douro at Vila Real, Portugal*

### Introduction

Nowadays, it is critical to understand if early involvement in multiple sports could be more advantageous than a specialized practice (Côté, & Vierimaa, 2014). The previous sport experiences provided by each of these paths may limit or greatly enhance the effects of the training programs. This particular topic remains unexplored, therefore the aim of this study was to examine the effect of a physical literacy and differential learning program in motor, technical and tactical basketball skills, when accounting for different early sport involvement.

### Method

Seventy six college students (age: M=20.4, SD=1.9) were randomly divided into control and experimental groups. According to the information provided by the participants about the quantity and type of sporting activities performed throughout their sport careers, they were also allocated in three different paths: (i) non-structured practice ( $n=14$ ), (ii) early sport involvement ( $n=34$ ), and (iii) late sport involvement ( $n=28$ ). Variables under study included agility (*illinois agility test*), technical skills (*taco bell challenge*), and also successful and unsuccessful tactical actions performed within a 4-on-4 full-court basketball game. The program was based in physical literacy and differential learning approaches. The effects were tested using an analysis of covariance, where the pre-test scores were used as covariate, the post-test scores as dependent variable and the group as independent variable. The questionnaires were evaluated with intra-class correlation coefficients. All data were analyzed with the SPSS ( $p \leq .05$ ). Effect sizes were also calculated for each of the key comparisons in the experiment.

### Results

The results suggest improvements in motor, technical and tactical basketball skills regardless of the sport career. The late sport specialization group revealed larger benefits, contrarily to the non-structured practice that showed less sensitivity to the program. Large effects of the program were observed in motor skills such as agility and simultaneously in decrease of unsuccessful actions performed within the basketball game.

### Conclusion

Overall, this study provided evidence of how previous sport experiences affect the skills acquisition and contribute to adapt to new contexts with motor and perceptual challenges, reinforcing the idea that the diversification path includes several advantages in later sport performance.

### References

Côté, J., & Vierimaa, M. (2014). The developmental model of sport participation: 15 years after its first conceptualization. *Science & Sports, 29, Supplement* (0), S63-S69. doi: <http://dx.doi.org/10.1016/j.scispo.2014.08.133>.

**Keywords:** nonlinear pedagogy; skill acquisition; performance analysis; team sports.

## 26. PERFORMANCE AND VARIABILITY PROFILES IN COMPETITION OF NBA PLAYERS: COMPARING BETWEEN ALL-STAR AND NON-ALL-STAR PLAYERS

Nuno Mateus<sup>1</sup>, Isabel Gomes<sup>1</sup>, Nuno Leite<sup>1</sup>, Jaime Sampaio<sup>1</sup>

<sup>1</sup>*CreativeLab-CIDESD, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal*

### Introduction

The National Basketball Association (NBA) is complementing the standard game statistical analysis with player-tracking systems that allow measuring several more variables, captured at high frequencies (25fps). At the moment, there is no research describing the value of these new variables, such as the distance covered or the average speed per minute of play. The aim of this study was to identify the most discriminant game statistical variables between NBA all-star and non-all-star players during home and away games.

### Methods

Statistical records from 712 NBA games of 2013-2014 NBA regular season were obtained from the official NBA site. The selected games ended all with a final outcome equal to or less than 10 points difference. The sample comprised a total of 14150 performance records from 463 players. Data processing was carried out in two phases: first, a one-way analysis of variance compared the mean profiles of players according to the four analysed groups (all-star vs non-all-star, home and away games); second, a discriminant analysis used the mean and afterwards the standard deviations to identify the most powerful variables to discriminant performance and variability profiles from the four groups of players.

### Results

The results allowed identifying differences in most of the variables between the groups, with better performance for the all-star players. However the effect of game location was not substantial. The performance and variability profiles were clearly discriminated in the four groups, with significantly different matrices. The performance profiles were discriminated by the differences in free-throws made (Structural coefficient, SC=.82), field-goals made (SC=.67) and contested field-goals made (SC=.61). The variability in performance was distinguished by differences in free-throws made (SC=.81), turnovers (SC=.61) and free-throws missed (SC=.60). The reclassifications of the players in the original groups were moderate to performance (57.1%) and variability (57.7%), but always lower for all-star players (particularly when playing at home).

### Conclusions

The results contribute to understand that new tracking variables are not very discriminant neither for performance or variability (distance and speed). In addition, this study allowed reducing the variables that help to measure performance in these contexts and simultaneously to understand the most significant sources of variability during this level of competition.

**Keywords:** Team Sports; Discriminant Analysis; Game Location.

## 30. TYPICAL WEEKLY WORKLOAD OF UNDER-15, UNDER-17 AND UNDER-19 ELITE PORTUGUESE FOOTBALL PLAYERS

Diogo Coutinho<sup>1</sup>, Bruno Gonçalves<sup>1</sup>, Bruno Figueira<sup>1</sup>, Eduardo Abade<sup>1</sup>, Rui Marcelino<sup>1</sup>, Jaime Sampaio<sup>1</sup>

<sup>1</sup> *CreativeLab, Research Center in Sports Sciences, Health and Human Development (CIDESD), University of Trás-os-Montes e Alto Douro, Vila Real, Portugal.*

### Introduction

Elite football imposes important demands on players and requires optimal adaptations during training sessions (Foster, 2001). Thus, monitoring the training process is critical to establish specific guidelines to enhance players' performances. Unfortunately, this information is poorly explored by literature. Similarly, there is little information about the load-recovery interactions during the training microcycles. Consequently, the aim of this study was to describe the variations of time-motion and physiological profiles during a one-week microcycle in Under-15 (U15), Under-17 (U17) and Under-19 (U19) age groups.

### Methods

One-hundred and fifty-one elite Portuguese players of U15 (age  $14.0 \pm 0.2$  n=56), U17 (age  $15.8 \pm 0.4$  n=66) and U19 (age  $17.8 \pm 0.6$  n=19) were monitored during 33 training sessions (TS) (U15 n=12, U17 n=11 and U19 n=10 TS). The TS data was captured at 15 Hz by GPS devices and were divided in Post-Match (first session after Match), Pre-Match (session before the match) and Middle Week (average of remaining sessions). A repeated measures ANOVA was performed for each age group to identify differences in time-motion, heart rate and body impact zones according to the different week training moments. Pairwise differences and post-hoc comparisons were assessed with Bonferroni post-hoc test and effect size was presented as eta squared ( $\eta^2$ ). The sprint variables were compared across conditions using non-parametric Friedman ANOVA and if required, the Wilcoxon test was used for post-hoc comparisons. In addition, the effect sizes (ES) were calculated.

### Results

The U15 Middle Week showed higher number of sprints, distance covered in intermediate speed zones and time spent above 90%  $HR_{max}$ , while the Pre-Match presented higher distance covered above  $18 \text{ km} \cdot \text{h}^{-1}$  and time spent below 75%  $HR_{max}$ . In U17, both Pre-Match and Post-Match presented lower values than Middle Week in most of the variables. The Post-Match in U19 showed higher values of distance covered above  $13 \text{ km} \cdot \text{h}^{-1}$ , body impacts above 10G and time spent above 85%  $HR_{max}$ . Finally, the Pre-Match presented 35% to 100% less values than Middle Week.

### Conclusion

The U15 priority in the development of technical skill and physical condition may compromise the training load schedule imposed to the players. The level of maturation in the U17 and coach concerns with players' physical conditioning contributed to high variability. Finally, the U19 competitive aim affected the week training load. Additionally, all age groups used SGGs, which seem to reproduce the functional movements used in match.

### Reference

Foster, C., Florhaug, J.A., Franklin, J., Gottschall, L., Hrovatin, L.A., Parker, S., et al. (2001). A new approach to monitoring exercise training. *Journal of Strength and Conditioning Research*, 15(1), 109-115.

**Keywords:** development ages; external load; internal load; training microcycle; Periodization.



# 33. EFFECTS OF USING BALLS FROM OTHER SPORTS ON EXTERNAL WORKLOAD OF PLAYERS DURING FOOTBALL SMALL-SIDED GAMES

Pasquarelli, B.N.<sup>1,2</sup>, Marcelino, R.<sup>1</sup>, Gonçalves, B.<sup>1</sup>, Sampaio, J.<sup>1</sup>

<sup>1</sup> *CreativeLab-CIDESD, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal*  
<sup>2</sup> *Universidade Estadual de Campinas, Campinas-SP, Brasil*

## Introduction

Understanding the effects of task constraints during football SSG allows to optimize practice planning and performance. Using different balls to play is one of several possibilities often used to generate changes in motor skills variability and also in task intensity. Thus, the aim of this study was to identify the effects of using balls from other sports (football, handball and rugby) on external workload of players during football SSG.

## Methods

Ten young footballers ( $M=14.2\pm 0.5$  years) from a high-level team played 4x4 SSG (40.3m x 16.5m, 3 min) with three different conditions: ball of football, ball of handball and ball of rugby. The variables analysed were the distance covered, distance covered in six intensity zones, average speed, body impacts, acceleration and deceleration in three intensity zones. The time-motion variables were collected with GPS at a sampling frequency of 15 Hz (SPI-Pro X II, GPSports, Canberra, Australia). Data were analysed for the total duration of the games (3 min) and minute-by-minute. Differences in workload when playing with the ball of football (football,  $N=28$ ) the ball of handball ( $N=20$ ) or the ball of rugby ( $N=16$ ) were assessed with standardized mean differences and confidence intervals.

## Results

During the 3-minute game, playing with the rugby ball had an effect of covering less distance in zone 5 (0.79 [0.15, 1.44], moderate), when compared with the ball of football. For all the others variables, either in the total or minute-by-minute analysis, the results showed identical workload between the 3 different conditions.

## Conclusion

In the current conditions the usage of three different ball types did not change the players' external workload. Thus, the usage of these task constraints may allow maintaining the external workload and varying the perceptual and motor skills.

## References

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2 ed.): Hillsdale, NJ: Lawrence Erlbaum Associates.  
Hill-Haas, S., Dawson, B., Impellizzeri, F., & Coutts, A. (2011). Physiology of small-sided games training in football a systematic review. *Sports Medicine*, 41(3), 199–220.

**Keywords:** football; external workload; performance analysis; small-sided games; youth athletes

## 34. THE EFFECT OF TEAM TIMEOUT ON THE PERFORMANCE INDICATORS IN HANDBALL MATCH ACCORDING TO THE COMPETITIVE CONTEXT

Fernando Gomes<sup>1</sup>, Anna Volossovitch<sup>1</sup>, António Paulo Ferreira<sup>1</sup>

<sup>1</sup> Universidade de Lisboa - Faculdade de Motricidade Humana - SpertLab, Lisboa, Portugal

### Introduction

Several recent studies focused on the analysis of performance variability before and after timeout calling (Gómez et al., 2011; Sampaio et al., 2013). Some studies confirmed the positive effects of timeout calling on the team performance in basketball (Gómez et al., 2011; Sampaio et al., 2013), other found no evidence of influence of TTO on the scoring dynamics (Saavedra et al., 2012). The aim of this study was to analyse the team timeout (TTO) effect on the team performance indicators (defensive effectiveness, offensive effectiveness and goal difference) according to the contextual variables (match location, match status and game period).

### Methods

A total of 286 TTO from 120 matches of ASOBAL League, played in 2010/2011 season, have been analysed. The performance indicators were registered in three different moments; a) when the TTO were called, b) at the third ball possession after TTO calling and c) at the fifth ball possession after TTO calling. The mixed ANOVA of repeated measures has been used to evaluate the TTO effect on score evolution in different game contexts.

### Results

The results show a positive significant main effect of TTO on the defensive effectiveness. A significant positive interactive effect of TTO calling and game period was observed on the team offensive effectiveness. The effect of TTO on the goal difference obtained in three and five ball possessions after TTO depends on the game period and match status (current score difference) at the moment of TTO request. The TTO effect was significantly positive in game period [31'-50'] and significantly negative in game period [21'-30']. When the team was winning [1; 9] the TTO effect on the following goal difference was negative. However, when the team was drawing or loosing [-4; 0], [-10; -5] the TTO request revealed positive effect on the following goal difference.

### Conclusion

The results suggest that the effect of TTO in handball varies according to the game context. Further research should analyze the effect of TTO in relation with the coach's verbal behavior during the TTO.

**Acknowledgement:** This work is supported by the Portuguese Foundation of Science and Technology under grant SFRH / BD / 46468 / 2008.

### References

- Gómez, M. A., Jiménez, S., Navarro, R., Lago-Peña, C., & Sampaio, J. (2011). Effects of coaches' timeouts on basketball teams' offensive and defensive performances according to momentary differences in score and game period. *European Journal of Sport Science*, 11(5), 303-308.
- Sampaio, J., Lago-Peña, C., & Gómez, M. A. (2013). Brief exploration of short and mid-term timeout effects on basketball scoring according to situational variables. *European Journal of Sport Science*, 13(1), 25-30. doi: 10.1080/17461391.2011.582163.
- Saavedra, S., Mukherjee, S., & Bagrow, J. P. (2012). Is coaching experience associated with effective use of timeouts in basketball? *Scientific Reports*, 2, article 676. doi: 10.1038/srep00676.

**Keywords:** Timeout; Handball; Performance; Effects.

# 43. QUANTITATIVE ANALYSIS OF LEADER-FOLLOWER INTERACTIONS BETWEEN FOOTBALL PLAYERS

Marcelino, R.<sup>1</sup>, Nagy, M.<sup>2,3,4</sup>, Gonçalves, B.<sup>1</sup>, Sampaio, J.<sup>1</sup>

<sup>1</sup>*CreativeLab, Research Center in Sports Sciences, Health Sciences and Human Development (CIDESD), Vila Real, Portugal;* <sup>2</sup>*MTA-ELTE Statistical and Biological Physics Research Group of the Hungarian Academy of Sciences, Budapest, Hungary;*

<sup>3</sup>*Department of Biological Physics, Eötvös University, Budapest, Hungary;*

<sup>4</sup>*Department of Zoology, University of Oxford, Oxford, United Kingdom.*

## Introduction

Identifying leader-follower interactions using Directional Correlation Delay Time (DCDT) was successfully used to reveal the behavioural rules that govern phenomena of collective movement in animals (Akos, Beck, Nagy, Vicsek, & Kubinyi, 2014; Nagy, Akos, Biro, & Vicsek, 2010). In team sports, players could be considered as elements of a system that move together in order to achieve a common goal. Thus, the aims of this study were to assess tactical performance of football players through collective measures based in DCDT technique, and identify leadership in teams' collective movements from highly similar segments of the tracks.

## Methods

Fourteen male footballers (14.6±0.3 years) participated in a cross-sectional study by playing a small-sided game (number of players: 7x7+GKs; area of field: 60x40 meters; game duration: 10 minutes). The geodetic coordinates provided by the 15Hz non-differential GPS were converted into x and y coordinates using the Flat Earth model. To determine leader-follower interactions in the game we calculated the DCDT (Nagy et al., 2010) for each pair of players of each team using a 6-second-long time windows, and also for all players independently of the belonging team.

## Results

We detect between the 91 possible pairs of players in total 17705 interaction events (1180 seconds of interactions) where the directional correlation of the segments is higher than 0.95. The average number of interactions per pair between opponents (230±290 (mean±SD)) was higher than the average number of interactions per pair between teammates (120±130 for one team and 190±220 for the other team). The number of interactions between the pairs of teammates was heterogenic for the analysed teams (range: 4% - 29%, and 8% - 19%).

## Conclusion

Directional Correlation Delay Time method reveals different leader/follow interactions between football players. Inside the same team there are players more engaged with the movements of the teammates and/or opponents, either in leading or in following movements, and others that seem to behave more individually. The players with more collective leading movements according to their teammates were the same with more leading movements according to the opponents. The players with a profile of following tend to follow either the teammates or the opponents.

## References

- Akos, Z., Beck, R., Nagy, M., Vicsek, T., & Kubinyi, E. (2014). Leadership and path characteristics during walks are linked to dominance order and individual traits in dogs. *PLoS Comput Biol*, *10*(1), e1003446. doi: 10.1371/journal.pcbi.1003446
- Nagy, M., Akos, Z., Biro, D., & Vicsek, T. (2010). Hierarchical group dynamics in pigeon flocks. *Nature*, *464*(7290), 890-893. doi: 10.1038/nature08891

**Keywords:** Collective behavior; Collective motion; group dynamics; hierarchy; leadership.

## 47. EFFECTS OF GOAL MANIPULATION AND AGE LEVEL ON PLAYERS PERFORMANCE IN FUTSAL

Bruno Travassos<sup>1,2</sup>, Ricardo Duarte<sup>3</sup>, Luís Vilar<sup>3,4</sup>, Pedro Silva<sup>5</sup>, Paulo Pedroso<sup>1</sup>

<sup>1</sup>Universidade da Beira Interior, Covilhã, Portugal

<sup>2</sup>CIDESD, Universidade de Trás-os-Montes e Alto Douro, Vila Real

<sup>3</sup>CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Portugal

<sup>4</sup>Universidade Europeia, Lisboa, Portugal

<sup>5</sup>Faculdade de Desporto, Universidade do Porto, Portugal

### Introduction

In team sports, the manipulation of key task constraints such as pitch size, player numbers, number of goals or rules create the optimal boundary conditions to promote the emergence of spontaneous patterns of interpersonal coordination. This may be especially important to set the appropriate boundary conditions for the youngsters that tend to agglomerate in the ball vicinity. Thus, this study aimed to analyse the influence of goals manipulation on the emergent patterns of interpersonal coordination, according to the age level.

### Methods

Forty players, recruited from four futsal teams, aged 10-to-16 years old, performed three matches with one and two goals located in the end line (pitch size: 36x18m; duration: 5 min). All matches were video recorded and the positional coordinates of players' and ball were acquired through a digitizing procedure with TACTO device. The emergent patterns of interpersonal coordination were measured by the distances between: i) the geometrical centre (GC) of each team; ii) the GC of each team and ball; iii) each player and his team GC, and; iv) each player and ball. We also measured: v) the difference between lengths of teams; vi) the difference between widths of teams and; vii) the length per width ratio of each team. The dependent variables were subjected to 4 (age) x 2 (game conditions) mixed-model ANOVAs.

### Results

The goals manipulation showed a significant influence in: i) the distances between the GC of each team; ii) the difference between the width of both teams, and; iii) the length per width ratio of each team. The age revealed a significant effect in: i) the distance between the GC of each team and ball; ii) the distance between each player and the GC of their team; iii) the distance between each player and the ball, and; iv) the length per width ratio of each team. A significant interaction effect was observed only in the ratio between the widths of both teams.

### Conclusion

Findings revealed an effect of age level on the relational distances between players to the ball and to the GC. The manipulation on the number of goals revealed an effect on the teams' spatial relation, especially on the width, contributing to decrease the agglomeration of players around the ball. When playing with two goals the width ratio between teams was larger, promoting adaptations on the interpersonal coordination tendencies displayed by players.

**Keywords:** Tactical behavior; Task manipulation; interpersonal coordination.

## 52. THE CHANGING RULE EFFECT ON BASKETBALL PERFORMANCE

Pedro Moniz-Pereira<sup>1</sup>, António Paulo Ferreira<sup>1</sup>, Ana Isabel Carita<sup>1</sup>

*SpertLab, Faculdade de Motricidade Humana, Universidade de Lisboa, Portugal*

### Introduction

In the beginning of 2009/10 season, the new FIBA basketball rules were experimented in the Spanish Basketball League (LEB-Oro). The basketball court has integrated the so called “no-charge semicircles”, moved the three-point arc 6.75 meters away from the basket and changed the shape and dimensions of the restricted areas. The present study aimed to analyse the effect of the changing rules in the performance indicators of basketball game.

### Methods

A total of 1836 basketball games were separated into two sub-groups: before the changing rules (BCR), 837 games played in the three seasons immediately before the 2009/10 season (2006/07, 2007/08 and 2008/09); and after the changing rules (ACR), 869 games played in the first three seasons played with the new rules (2009/10, 2010/11 and 2011/2012). Thirteen game-related statistics of a basketball game were utilized in the study and were denominated as simple parameters (SP). Ten collective efficiency parameters (CEP) were considered and calculated taking account the SP. The data was analysed according to three stages. First, it was determined the simple arithmetic average between the winner and the loser teams for each SP in each game. Second, the SP were normalized to 100 ball possessions (Kubatko, Oliver, Pelton, & Rosenbaum, 2007), and then were used to calculate the CEP. Finally, two-independent discriminant analyses were carried out to analyse the effects of changing rules on the SP and the CEP. The statistics that discriminate the games played BCR and ACR were obtained through the analysis of structure coefficients (SC).

### Results

The discriminant functions were statistically significant for both game-related statistics:  $\chi^2= 224.43$ ,  $p<0.001$  for SP and  $\chi^2= 171.22$ ,  $p<0.001$  for CEP. The results from the SP demonstrated that field goals, free-throws and fouls discriminate the games played BCR and ACR – 2-points field goal made (SC=-0.30), 2-points field goal missed (SC=-0.52), 3-points field goal made (SC=0.47), 3-points field goal missed (SC=0.34), free-throws made (SC=0.46), free-throws missed (SC=0.42), fouls (SC=0.51) (table 1). While the results from the CEP analysis showed the offensive rating (SC=-0.46), and the adjust field goal percentage (SC=0.35) as the discriminators of changing rules effect (table 2).

### Conclusion

The findings revealed that the new rules introduced lower levels of offensive rating in the basketball game. In addition, results pointed out that teams try to shot more often from 2-points than from 3-points.

### References

Kubatko, J., Oliver, D., Pelton, K., & Rosenbaum, D. T. (2007). A Starting Point for Analyzing Basketball Statistics. *Journal of Quantitative Analysis in Sports*, 3 (3), Art. 1.

**Keywords:** Basketball; Rules changes; Game-analysis; Game-related statistics.

## 54. INDIVIDUAL AND COLLECTIVE CREATIVITY IN YOUNG FOOTBALLERS

Alexandra Silva<sup>1</sup>, Bruno Gonçalves<sup>1</sup>, Sara Santos<sup>1</sup>, Nuno Mateus<sup>1</sup>, Jaime Sampaio<sup>1</sup>, Nuno Leite<sup>1</sup>

<sup>1</sup> University of Trás-os-Montes e Alto Douro, Vila Real, Portugal

### Introduction

The present study aimed to (i) identify the relationship between young footballers individual (IC) and collective (CC) creativity during offensive play; and (ii) identify the effect of a 12-week training program based on technical repertoire and attentional focus broadening, using Non-linear Pedagogy and Differential Learning.

**Methods:** The sample was made of 25 players (age  $13,92 \pm 0,64$  and  $5,36 \pm 2,14$  years of practice). The IC evaluation was performed using a 1vs1 situation and the CC evaluation using a Gk+5vs5+Gk game. The teams involved in the collective task were organized by IC punctuation (“more creative team” vs. “less creative team”), best friends dyads and randomly. Positional data, external and internal load were measured and video recordings were held for post-evaluation of technical actions. The Covariance Analysis (ANCOVA) was used to evaluate the training program impact on the studied variables; and the Paired-samples t Test was used to identify the existing differences between players’ IC and CC “score” at pre and post-test.

### Results

The results shown that IC scores improvements were followed by CC scores enhancement, suggesting a possible relationship between both. On the other hand, the obtained results for positional variables suggest an improvement in the experimental group tactical performance, which seems to be also reflected on the internal and external load variables.

### Conclusion

It was verified that, when we gather the subjects with highest scores of IC in the same team, they distinguish themselves from the less creative players’ group on the average of CC punctuations. This idea suggests that the most creative players in the 1vs1 situation keep their scores high when they enrol in the Gk+5v5+Gk game. The training program effects were evident by increasing shooting initiatives and on the CC average of the players that integrated the more and less creative teams.

### References

- Parjanen, S. (2012). Experiencing Creativity in the Organization: From Individual Creativity to Collective Creativity. *Interdisciplinary Journal of Information, Knowledge, and management*, vol.7, pp. 109-128.
- Memmert, D. (2010). Play and practice in the development of sport-specific creativity in team ball sports. *High Ability Studies*, vol.21, nº1, June 2010, pp. 3-18.
- Memmert, D. (2011). Sports and Creativity. *Encyclopedia of Creativity*, second edition, vol.2, pp. 373-378.
- Schollhorn, W., Hegen, P., Davids, K. (2012). The Nonlinear Nature of Learning – A Differential Learning Approach. *The Open Sports Sciences Journal*, 5, (Suppl 1-M11), pp. 100-112.

**Keywords:** Creativity; Football; Technical repertoire; Attentional Focus; Non-linear Pedagogy; Differential Learning.

# 59. THE ACQUISITION OF AQUATIC SKILLS IN PRESCHOOL CHILDREN VARIES ACCORDING TO THE WATER DEEP ENVIRONMENT DURING SWIMMING LESSONS

H. A. Rocha<sup>1</sup>, D. A. Marinho<sup>1,2</sup>, A. M. Costa<sup>1,2,3</sup>

<sup>1</sup> University of Beira Interior. Department of Sports Sciences, Covilhã, Portugal  
<sup>2</sup> Research Centre in Sports, Health and Human Development, Vila Real, Portugal  
<sup>3</sup> CICS-UBI, Health Sciences Research Center, Covilhã, Portugal

## Introduction

There are several factors that directly influence the aquatic skills acquisition in young children. One determinant factor seems to be the variation of the learning environment, in particular the water depth (Costa, et al, 2012). However, studies are scarce and follow a cross-sectional approach. Therefore, the purpose of our study was to analyse the differences on developing pre-schooler's aquatic skills between deep and shallow water aquatic programs after 6 months of practice.

## Methods

The study sample consisted of 21 Portuguese elementary school-aged children of both genders ( $4.7 \pm 0.508$  yr), with no previous experience in aquatic programs. The children were also divided into two distinct classes with a similar aquatic program but performed on a different water deep environment: 10 and 11 children performed all the swimming lessons in shallow water and deep water, respectively. All children were evaluated twice for their aquatic readiness using an observation form field of 17 aquatic motor skills based on Langerdorfer & Bruya (1995): during the first session (T0) and after six months of practice (two session per week - 68 sessions) (T1). Each of these 17 skills was divided into increasing levels of complexity (3, 4 or 5, depending on the skill category). A discriminant analysis was conducted with  $\Lambda$  wilk's method to build a predictive model for group membership (aquatic competence for shallow and deep water students).

## Results

At baseline (T0), no significant differences in aquatic readiness were found between shallow and deep water students. After 6 months of practice there were significant differences ( $p > 0.05$ ) between the means of both groups in five aquatic skills: breath control immersion of the face and eye opening ( $4.182 \pm 0.874$  vs  $3.100 \pm 1.370$ , Sk3); horizontal buoyancy ( $2.636 \pm 1.120$  vs  $1.500 \pm 0.850$  Sk4); body position at ventral gliding ( $2.727 \pm 0.647$  vs  $1.200 \pm 0.422$  Sk5); body position at dorsal gliding ( $2.091 \pm 0.831$  vs  $1.100 \pm 0.316$  Sk6); leg kick with breath control at ventral body position, without any flutter device ( $2.0000 \pm 0.63246$  vs  $1.400 \pm 0.516$  Sk10). The discriminant function revealed a significant association between groups and all predictors, accounting for  $(0.979)^2 = 0.96\%$  between group variability ( $\Lambda = 0.041$ ,  $Qui^2 = 36.755$ ,  $p < 0.001$ ). However, the structure matrix revealed only one significant predictor with a relevant absolute size of correlation within function (Sk5,  $r = 0.300$ ).

## Conclusion

The results allow us to suggest that a shallow water environment seems to be more suitable for the development of basic aquatic skills in preschool children. The students deep water had also worst performance compared with students in shallow water in all skills, except in three skills of the total of seventeen.

## References

Costa, A., Marinho, D., Rocha, H., Silva, A., Barbosa, T., Ferreira, S., & Martins, M. (2012). Deep and Shallow Water Effects on Developing Preschoolers' Aquatic Skills. *Journal of human kinetics*, 32, 211-219. doi:10.2478/v10078-012-0037-1  
Langerdorfer, S.; & Bruya, L. (1995). *Aquatic readiness*. Developing water competence in young children. Human Kinetics. Champaign, Illinois

**Keywords:** aquatic skills; swimming lessons; children.

# 66. A ANÁLISE DINÂMICA DAS REDES NO FUTEBOL: CONTRIBUTO PARA A DETERMINAÇÃO DA INFLUÊNCIA INDIVIDUAL DOS JOGADORES

Vítor Pereira<sup>1</sup>, Ricardo Duarte<sup>1</sup>

<sup>1</sup>Faculdade de Motricidade Humana, Lisboa, Portugal

## Introdução

A análise de redes sociais, com origem na sociologia (teoria das redes sociais) e na matemática (teoria dos grafos) (Borgatti et al., 2009), tem sido aplicada recentemente à análise do desempenho individual e coletivo no Futebol. Neste sentido, a maioria dos estudos tem analisado as redes de interação entre os jogadores através do passe, entendendo os jogadores como os nodos dessa rede (Duch et al., 2010). Contudo, apenas um trabalho se dedicou a entender o carácter dinâmico das interações desenvolvidas pelos jogadores no seio da equipa (Yamamoto & Yokoyama, 2011), tendo demonstrado importantes variações nesses mesmos padrões de interação ao longo do jogo. Este trabalho teve como objectivo desenvolver um novo método de análise dinâmica de redes que permita identificar a estabilidade e a variabilidade da influência de cada jogador na equipa durante o jogo.

## Método

A amostra do estudo foi constituída por um total de  $n=305$  passes certos efetuados por 22 jogadores de futebol profissional, que participaram na primeira parte de um jogo oficial da *Premier League*, na época 2012-2013. Foram utilizadas a *betweenness*, *eigenvector* e *clustering coefficient* como medidas da influência de cada indivíduo na rede de interação do passe. Para captarmos continuamente a influência de cada jogador calculámos as redes e respetivas métricas por períodos de 5 minutos (Yamamoto & Yokoyama, 2011), com uma janela deslizante de 1 minuto. O tratamento dos dados foi realizado através do software NODE XL, e foram utilizados os parâmetros média  $\pm$  coeficiente de variação (%) para inspeção dos resultados.

## Resultados

Os valores da média $\pm$ CV foram de  $4,57\pm 126\%$ ,  $0,154\pm 53\%$  e  $0,306\pm 105\%$  respetivamente para a *betweenness*, *eigenvector* e *clustering coefficient*. A Figura 1 mostra a variação da *eigenvector* ao longo da primeira parte do jogo, sendo visível a variabilidade entre jogadores e dos jogadores ao longo do tempo.

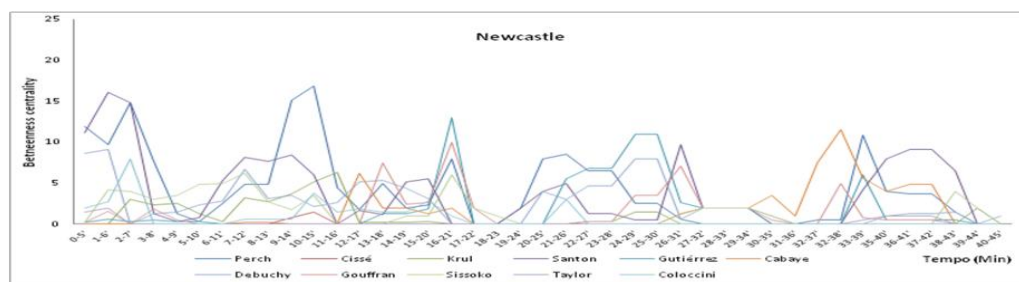


Figura 1. Evolução dos valores de *eigenvector* dos jogadores do Newcastle na 1ª parte.

## Conclusão

Tal como os elevados valores do coeficiente de variação sugerem, existem grandes variações na influência de cada jogador no desempenho da equipa, quer entre diferentes jogadores, quer para os mesmos jogadores ao longo do jogo. O método desenvolvido parece sensível para detetar as variações dinâmicas da influência dos jogadores ao longo do jogo de futebol.

## Referências

- Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *Science* 323(5916), 892-895.  
Duch, J., Waitzman, J., & Amaral, A. (2010). Quantifying the Performance of Individual Players in a Team Activity. *PLoS ONE* 5(6): e10937.  
Yamamoto, Y., & Yokoyama, K. (2011). Common and unique network dynamics in football games. *PLoS ONE*, 6(12), e29638.

**Keywords:** Redes; Futebol; Performance individual



# 67. PHYSICAL AND TACTICAL PERFORMANCE OF ELITE FOOTBALLERS DURING THE PRESEASON

Hugo Folgado <sup>1,2</sup>, Jaime Sampaio <sup>2</sup>

<sup>1</sup> Departamento de Desporto e Saúde, Universidade de Évora, Escola de Ciências e Tecnologia, Évora, Portugal; <sup>2</sup> Research Center for Sports Sciences, Health and Human Development (CIDESD), Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

## Introduction

During the preseason coaches aim to improve football players' performance, by developing their physical fitness level and tactical response (Boullosa et al., 2012). However, there is scarce knowledge on how players develop their performance during this season period (Castagna, Impellizzeri, Chauachi, & Manzi, 2013), particularly in terms of tactical performance. The aim of this study was to identify changes in tactical and physical performances in both training and preparation matches during the preseason of a professional football team.

## Methods

Thirty professional football players were monitored during the first five weeks of the season during both training and match situations. Players used individual GPS units to measure their physical (total distance covered and distance covered at different intensities) and tactical (percentage of longitudinal and lateral movement synchronization between players) performances. In order to assess players' response during the training, several GK+8vs.8+GK large-sided games played in half-pitch (55x50m) were performed during the team preseason. Players' performance during the competition was evaluated in six preparation matches. Training and match results were compared by two periods, divided by the first or the later weeks of training. Match results were also compared according to the opposition level.

## Results

Training situation results revealed that the GK+8vs.8+GK situation promoted similar physiological responses during the first and the later preseason period. However, players showed improved tactical performance, by displaying higher levels of synchronization, during the later preseason period. Match tactical performance showed no clear trend while comparing fixtures played during the first and later preseason period. In terms of physical performance, matches played during the later preseason period revealed that players covered more distance at higher intensities. Still, no differences were found in the total distance covered between preseason periods. Finally, the competitive level of the opposition team influenced tactical performance during preseason matches, as higher-level opponents promoted a more synchronized behavior between players of the analyzed team.

## Conclusion

The assessment of players' performance during the preseason provides useful information to coaches, enabling the optimization of team preparation strategies. In this sense, simply evaluating players' physical performance does not seem to expose all of the development players achieve during this season period. As such, there is the need for interrelated indicators, which consider not only players' physical performance, but also the relations players establish during the game. In our study, tactical variables seem to reflect this level of performance, measured by players' synchronization changes during both training and competition.

## References

Boullosa, D. A., Abreu, L., Nakamura, F. Y., Muñoz, V. E., Dominguez, E., & Leicht, A. S. (2012). Cardiac Autonomic Adaptations in Elite Spanish Soccer Players during Pre-season. *International Journal of Sports Physiology and Performance*. Castagna, C., Impellizzeri, F. M., Chauachi, A., & Manzi, V. (2013). Pre-Season Variations in Aerobic Fitness and Performance in Elite Standard Soccer Players. *The Journal of Strength & Conditioning Research*, 1. doi:10.1519/JSC.0b013e31828d61a8

**Keywords:** Football; Synchronization; Performance.

# 69. SOCCER ANALYSIS OF THE INTERNATIONAL MILAN LONG TERM ATTACK THAT END SUCCESSFULLY

António Barbosa<sup>1</sup>, Hugo Sarmento<sup>2,3</sup>, José Neto<sup>2</sup>, Jorge Campaniço<sup>4</sup>

<sup>1</sup>*Polytechnic Institute of Guarda, Guarda, Portugal*

<sup>2</sup>*University Institute of Maia, Portugal*

<sup>3</sup>*Polytechnic Institute of Viseu, Viseu, Portugal*

<sup>4</sup>*University of Trás-os-Montes e Alto Douro, Vila Real, Portugal*

## Introduction

The detection and analysis of regular structures of behavior in soccer has received increasing attention from researchers and trainers. The main purpose of this study was to detect temporal regular structures (t-pattern) of behavior in the International Milan Offensive Process that end successfully, in the long term attack. The studied machetes take place in 2009/2010 sporting season.

## Methods

To collect data, we coded twelve games of the International Milan soccer team, using the observational instrument developed and validated by Sarmento et al. (2010).

We used the software THÈME 5.0 for the detection of the t-patterns which is a professional system for detecting and analyzing hidden patterns in behavior, by performing intensive structural analysis of behavioral data. The study of the reliability shows high levels (above 0.95 for all criteria) for the intra-observer agreement. The level of significance was set at 0.005.

## Results

We detected one completed t-patterns (were repeated three times) referring to the whole process, from recovering possession of the ball until completing the offensive process (OP) success fully.

The analyze of the completed-pattern, allow us to understand that the area of recovery of possession is the left corridor of the defensive midfield, in a context of relative superiority. The second action, was a development by reception/control and take place in the same field zone, maintaining the numeric relation. The third action describes a development by short / medium pass, in the central corridor of the defensive midfield. The pattern ended with a shot, from zone eleven (offensive third) in relative inferiority.

## Conclusion

We verify the reduced occurrence of offensive patterns, in International Milan, that meet the methodological framework able to describe the long term attack in soccer.

## References

Sarmento, H., Anguera, T.; Campaniço, J. & Leitão, J. (2010). Development and Validation of a Notational System to Study the Offensive Process in Football. *Medicina (Kaunas)*, 46(6), 401-407.

**Keywords:** Soccer; International Milan; long term attack; t-pattern; Success.

# 71. HOW GAME PHASE AFFECTS THE TYPE OF SET USED BY U19, U21 AND SENIOR MALE BEACH VOLLEYBALL PLAYERS

Alexandre I. A. Medeiros <sup>1</sup>, Rui Marcelino <sup>2</sup>, Isabel Mesquita <sup>1</sup>, José M. Palao <sup>3</sup>

<sup>1</sup> University of Porto, Porto, Portugal

<sup>2</sup> CIDESD – Research Center in Sports, Health Sciences and Human Development, Portugal

<sup>3</sup> University of Murcia, Murcia, Spain

## Introduction

In beach volleyball, the set is the action executed to send the ball to the attacker. Senior male blockers and defenders execute the forearm more frequently to set. No information has been found in the literature related to the execution of the set in relation to player role, age group and game phase. The purpose of this study was to determine the types of set used in categories U19, U21 and senior regarding to player role and game phase.

## Methods

A total of 348 sets (15 games) from U19, 286 sets (12 games) from U21, and 526 sets (21 games) from senior were analysed. Actions were collected from their respective World Championships (season 2010 and 2011). Sets analysed were selected randomly according to the level of the teams and their confrontation. Only sets from first and second sets of the matches were included. The variables studied were: type of set (overhead pass; forearm pass), player role (defenders; blockers), age groups (U19, U21, and senior), and game phase (K1 and K2). Data were collected through TEBEVOL (Palao & Manzanares, 2009). Data was collected by trained observer (reliability lower than 5% error). Chi-square test was used to test differences between analysed variables. Statistic significance was set at  $p < 0.05$ .

## Results

Table 1 present the percentage distribution of the set by technique and game phase.

**Table 1:** Relation between of type of set (categories U19, U21 and senior) and game phase.

	Blocker						Defender					
	U19	U21	Senior	U19	U21	Senior	U19	U21	Senior	U19	U21	Senior
	Set (K1)			Set (K2)			Set (K1)			Set (K2)		
Overhead pass	24.3% <sup>a</sup>	33.3% <sup>b</sup>	43.8% <sup>c</sup>	11.9% <sup>a</sup>	8.5% <sup>b</sup>	18.1% <sup>c</sup>	32.1% <sup>d</sup>	40.5% <sup>e</sup>	41.5% <sup>f</sup>	10.1% <sup>d</sup>	16.7% <sup>e</sup>	14.4% <sup>f</sup>
Forearm pass	75.7% <sup>g</sup>	66.7% <sup>h</sup>	56.2% <sup>i</sup>	88.1% <sup>g</sup>	91.5% <sup>h</sup>	81.9% <sup>i</sup>	67.9% <sup>j</sup>	59.5% <sup>k</sup>	58.5% <sup>j</sup>	89.9% <sup>j</sup>	83.3% <sup>k</sup>	85.6% <sup>l</sup>

## Conclusion

Forearm was the type of set more used. Overhead set was more used in the side-out phase. Probably due to this phase in more organize and done stable conditions. The use of the overhead set in the side-out phase increase as higher is the age group. This tendency was not found in counter-attack phase. A slightly higher used of the overhead was found by defenders. This could be influences due to defenders are shorter than blocker (Palao, Gutierrez, & Frideres, 2008), and probably had better mobility.

In all the categories, blockers and defenders used more forearm pass in K2 than in K1. In senior players, in the side-out phase the use of overhead set is close to 50%. The data obtained in this study may serve as a reference for coaches to design the training process (player formation and task design) and monitor their evolution.

**Acknowledgement:** Capes-Brazil (068812-6/2012-2014).

## References

- Palao, J. M., & Manzanares, P. (2009). *Manual for observation instrument of techniques and efficacy in beach-volleyball*. Murcia, Spain.
- Palao, J. M., Gutiérrez, D., & Frideres, J. E. (2008). Height, weight, body mass index, and age in beach volleyball players in relation to level and position. *Journal of Sports Medicine & Physical Fitness*, 48(4), 466-471.

**Keywords:** Beach volleyball; Age group; Player role; Phase game.

# 73. TEAM PERFORMANCE ACCORDING TO BALL POSSESSION CHARACTERISTICS: A SOCIAL NETWORKS APPROACH

Sérgio Tomás<sup>1</sup>, Ricardo Duarte<sup>1</sup>

*Faculdade de Motricidade Humana, Universidade de Lisboa, Estrada da Costa, Cruz Quebrada, Portugal*

## Introduction

A recent networks analysis revealed that English Premier League teams with a possession game characterized by high passing work-rate and low centralization tended to be associated with best attacking performances (Grund, 2012). In the present study we investigated whether the collectively properties of the web of passing interpersonal interactions vary according to the competitive success of Spanish *La Liga* teams.

## Methods

Sample consisted of all the successful passes (n=26695) performed during 380 matches of the Spanish *La Liga* 2011/2012 season. Passing distribution raw data were obtained through the OPTA notation system (Liu et al., 2013). Social networks analyses were performed using Node XL software. To measure ball possession characteristics, we selected three team measures for analysis: average clustering (Opsach, & Panzarra, 2009), graph density (Freeman, 1979) and passing intensity (Grund, 2012). Competitive success were also determined through two-step cluster analysis using the total number of points and the ratio between goals scored and goals conceded as input predictor variables. One-way ANOVA with Games-Howell's post hoc tests were used to examine differences in ball possession characteristics.

## Results

The two-step cluster analysis divided the teams in 3 clusters of competitive success with an average silhouette of 0.70 (Predictor importance: goals ratio = 1.00, points earned = 0.83).

**Table 1 – Ball Possession Tendencies**

Competitive Success	Graph Density		Average clustering		Intensity	
	$\bar{x} \pm SD$	Sig.	$\bar{x} \pm SD$	Sig.	$\bar{x} \pm SD$	Sig.
Top-ranked teams cluster 1 (n=3)	.745 ± .058		.733 ± .061		.704 ± .072	
Intermediate-ranked teams cluster 2 (n=6)	11.546 ± .657	.001	11.456 ± .567	.001	11.032 ± .731	.001
Bottom-ranked teams cluster 3 (n=11)	15.737 ± 2.092		14.651 ± 1.393		13.382 ± 1.569	
	<i>C1=C2&gt;C3*</i>		<i>C1=C2&gt;C3*</i>		<i>C1&gt;C2&gt;C3**</i>	

Games-Howell's post hoc test, \* p < .001; \*\* p ≤ .002

Bottom-ranked teams showed less number of connected players and triangulations than intermediate and top-ranked teams. However, all the teams diverge in terms of passing intensity.

## Conclusion

Our findings suggest that when team players tend to be less connected with his teammates concerning their passing tendencies there is a trend to fall into one of the bottom-ranked teams. Importantly, our findings pointed out teams that use their possession time to give intensity to his game may increase their similarity with more top-ranked teams.

## References

- Freeman, L. C. (1979). Centrality in social networks conceptual clarification. *Social networks*, 1, 215-239.
- Grund, T.U. (2012). Network structure and team performance: The case of English Premier League Soccer Teams. *Soc. Netw.* <http://dx.doi.org/10.1016/j.socnet.2012.08.004>
- Liu, H., Hopkins, W., Gómez, M., Molinuevo, J. (2013). Inter-operator reliability of live football match statistics from OPTA Sportsdata. *International Journal of Performance Analysis in Sport*, 13(3), 803-821.
- Opsahl, T. & Panzaresa, P. (2009). Clustering in Weighted networks. *Social networks*, 31-2, 155-163.

**Keywords:** Team Performance; Competitive Success; ball possession.

# 83. THE EFFECT OF PERFORMANCE INDICATORS ON THE TIME OF THE FIRST GOAL SCORING IN THE FOOTBALL MATCH

José Pratas<sup>1</sup>, Anna Volossovitch<sup>1</sup>, Ana Isabel Carita<sup>1</sup>

<sup>1</sup> Faculty of Human Kinetics, University of Lisbon, Portugal

## Introduction

Scoring the first goal playing at home in soccer could be crucial for winning the game (Tenga, 2012; Leite, 2013). The aim of this study was to identify the performance indicators that influence the time of scoring the first goal in a high-level soccer match.

## Methods

A total of 240 matches of the Portuguese Premier League played in 2009/10 season have been analysed. Time of ball possession, shots on goal, set plays and disciplinary sanctions were selected as predictor variables and entered into the Weibull hazard model to represent how the hazard of the first goal scoring changed with time according to the performance indicators. The model was fitted using the *survreg function* of the R package version 2.37-7 (Therneau, 2014). All statistical analyses were carried out using Software R, version 3.0.2.

## Results

The results showed significant effect of the time of ball possession ( $p < 0.001$ ) on the time of the first goal scoring. Home teams, as well as their opponents with greater ball possession had a higher probability to score the first goal of the game. At the same time a larger number of shots on a goal ( $p < 0.001$ ) and set plays ( $p < 0.05$ ) accelerated the time of the first goal scored by the away teams. Disciplinary sanctions had no statistically significant effect on time of the first goal scored.

## Conclusion

Survival analysis highlights the importance of longer ball possession and greater number of shots on goal in different game situations to score the first goal before the opponent. Our findings suggest that the survival modelling is a useful tool for the performance analysis in soccer. Further research should analyse the influence of performance indicators on probability of scoring in soccer, considering the dynamics of teams' performance during the match.

## References

- Leite, W. (2013). Euro 2012: Analysis and Evaluation of Goals Scored. *International Journal of Sports Science*, 3(4): 102-106
- Tenga, A. (2012). Chapter: First goal and home advantage at different levels of play in professional soccer. *World Congress of Performance Analysis of Sport IX*, Publisher: London & New York: Routledge Taylor & Francis Group, Editors: D. Peters, P. G. O'Donoghue, pp.47-51
- Therneau, T. (2014). A Package for Survival Analysis in S. R package version 2.37-7, <http://CRAN.R-project.org/package=survival>

**Keywords:** soccer; survival analysis; performance indicators; first goal.

## 84. TIME-MOTION ANALYSIS IN YOUTH ELITE RUGBY PLAYERS DURING GAME TRAINING

Vasilica, I.<sup>1</sup>, Vaz, L.<sup>1</sup>

<sup>1</sup> Universidade de Trás-os-Montes e Alto Douro, CIDESD, Vila Real, Portugal

### Introduction

There is limited information on the match-play demands of Portuguese youth elite players. Therefore, the aim of this study was to analyze and estimate physical demands during match play in training context.

### Methods

18 players of the national under-20 Portuguese team were divided in two groups: 10 forwards (age 19.8±0.4 years, height 186.3±7.8 cm, weight 102.2±8.3 kg) and 8 backs (age 19.4±0.5 years, height 179.4±6.6 cm, weight 80.0±7.0 kg). Positional data were captured using a 15Hz non-differential global positioning system. The Cohen's  $d_{unb}$  effect sizes with 95% of confidence Intervals (95% CI) were calculated using pooled standard deviation for the comparisons and the magnitude thresholds for mean differences were: 0-0.2, trivial; >0.2-0.6, small; >0.6-1.2, moderate; >1.2-2.0, large; and >2.0, very large.

### Results

Overall, the backs' players obtained high values across all considered variables. Very large values were observed in total distance, zone 1 and zone 6. Large values were noted in ratio HVH-Very low. Moderate differences were observed in zone 2, zone 4 and zone 5. Finally, trivial/small differences values were observed in zone 3, total impacts, ratio HM-Very low and ratio Low-Very low.

### Conclusion

The present data demonstrated that the backs have higher physical demands during match play, principally in running top speeds and covering bigger total distances. Being smaller and lighter than the forwards group can influence these values. These findings provide information for the prescription of training and developing physical qualities demanded in youth elite rugby players.

**Keywords:** Time-motion; rugby youth elite; training context; global positioning system.

# 85. EXEMPLOS DE PRODUÇÃO DE MATERIAL DESPORTIVO ADAPTADO À INCLUSÃO DE ALUNOS COM DEFICIÊNCIA VISUAL

Campos, M.J.<sup>1</sup>, Cristóvão, C.<sup>1</sup>, Simões, R.<sup>1</sup>, Furtado, G.<sup>1</sup>

<sup>1</sup> Faculdade de Ciências do Desporto e Educação Física da Universidade de Coimbra

## Introdução

A Educação Física (EF) e a prática desportiva na escola são fundamentais para os jovens com deficiência visual (DV) pois são um verdadeiro motor habilitador e reabilitativo (Holmes et al., 2008). No entanto, os professores de EF apontam a inclusão dos alunos com DV como um desafio acrescido nas suas aulas. A falta de recursos didáticos adaptados às suas necessidades é um dos desafios mais mencionados na planificação e dinamização de exercícios para uma aula de EF inclusiva (Campos, 2013). Por forma a explorar o potencial da disciplina como ferramenta inclusiva, urge a pertinência do uso de recursos didáticos e de estratégias educativas que facilitem e promovam o envolvimento na prática desportiva de todos os alunos. É neste sentido que surge a importância do desenvolvimento de materiais adaptados que visem estimular e desenvolver a capacidade de perceção e apropriação da realidade por parte dos alunos com DV na aula de EF. Assim, o objetivo do presente estudo é apresentar materiais adaptados, facilmente construídos, que promovam a inclusão de alunos com DV nas atividades físicas e desportivas.

## Métodos

A metodologia utilizada prende-se com a elaboração de material desportivo, a partir de objetos facilmente reaproveitáveis. Para a construção de uma bola sonorizada e com textura diferenciada utilizou-se, entre outros, uma bola usada, fita adesiva anto-derrapante, guizos e spray. Outro material considerado relevante para as aulas de EF inclusiva foi a elaboração de vendas para os jovens sem DV experienciarem a sensação de estar privado do sentido da visão. Para a sua elaboração foi necessário óculos de natação usados e spray, entre outros materiais.

## Resultados

Através da construção e utilização destes recursos didáticos económicos, o professor de EF poderá colmatar algumas dificuldades e desafios encontrados no processo ensino-aprendizagem. Estes materiais poderão ser utilizados nas aulas de EF de futebol, goalball, slaloms, etc.

## Conclusão

Podemos concluir que a produção de ferramentas pedagógicas favorece a aprendizagem significativa dos jovens com DV e conseqüentemente promove uma participação mais ativa nas aulas de EF. É pois, fundamental, providenciar uma estimulação sistemática que os leve a sentir interesse pelo que os rodeia e lhes faculte conhecimentos e experiências tátilo-quinestésicas, através de materiais adaptados às suas necessidades. Uma vez que os professores desempenham um papel fulcral na mudança de atitudes face à inclusão, deverão estar dotados de estratégias e recursos que lhes permita incluir os alunos com DV nas aulas de EF.

**Keywords:** inclusão; educação física; deficiência visual; material adaptado.

# 91. GAME ANALYSIS IN THE ERA OF BIG DATA: A SOCIAL NETWORKS APPROACH

Ricardo Duarte

*CIPER, Faculdade de Motricidade Humana, Universidade de Lisboa, Portugal*

## Introduction

In the last 15 years, we entered in a period of accelerated access to large amount of data (Barris & Button, 2008). Today, tracked positional data and multiple-event notation systems are undoubtedly available at professional club setting. Performance analysis, like most scientific disciplines, lives in the era of 'big data' (Howe et al., 2008). As such, one important consequence is that performance analysts are struggling with large amount of data. This implies a re-definition of the more appropriate methods and tools to use, with implications to the way analysts are educated nowadays (Donovan, 2008). Thus, despite the need to have sophisticated technologies compiling all the statistical information from match performance, there is also a need to develop 'synthetic' methods and tools to enhance the usability of such 'big data' (e.g., Lames & McGarry, 2007). According to the 2011 McKinsey Global Institute report (Manyika et al., 2011), this need is particularly important when practitioners are interested to extract meaningful information from large amount of data sets and not only on how to store it in long-term. Here, we propose social networks analysis as a modelling and visualization technique allowing to objectively quantifying the individual, group and team performance in soccer in different timescales.

## Methods

Using large notation and positional data sets, this technique allows characterising the relationships among discrete nodes (e.g., players) in a graph or a network (e.g., a team), quantifying how information travels, or who has the most influence over whom.

Individual measures such as *betweenness* and *eigenvector* centrality were proposed as suitable to capture the influence of each player in a team. Using these individual measures, we developed a dynamic method to detect stability and variability in the influence of each player across the match.

## Results

The results suggested this method might be used to objectively evaluate the performance of players across different timescales, such as a match or a season.

Concerning the group level of analysis, we determined the number and composition of *cliques*. Data allowed the identification of cohesive, task-oriented sub-groups within a team. This group identification can assist analysts to objectively classify the players involved in specific patterns of interaction across the match, which might be important to enhance the quality of feedback from match performance. At the team level, *graph density*, *average clustering* and *intensity* were selected as relevant measures to discriminate team success in competition.

## Conclusion

Findings revealed that competitive performance was higher when teams displayed higher connectivity between nodes, but also a local tendency for the players to cluster together. So, less centralised teams seemed to have higher probability to finish the season higher in the ranking.

Social networks analysis seems to be a promising approach to transform multiple data into relevant performance-oriented information.

**Keywords:** Social Networks Analysis; Big Data; Complexity; Performance; Soccer.



STRONG



# 1. EFFECT OF TRAINING AND EXERCISE INTENSITY ON INDICES OF OXIDATIVE BALANCE

Cristina Monteiro<sup>1</sup>, Helena Santa-Clara<sup>1</sup>, Maria De Fátima Raposo<sup>1</sup>, Alice Gonçalves<sup>1</sup>, Edmond Rock<sup>2</sup>, Eliette Gueux<sup>2</sup>, Yves Rayssiguier<sup>2</sup>, André Mazur<sup>2</sup> and Maria José Laires<sup>3</sup>

<sup>1</sup> *Physiology and Biochemistry of Exercise Laboratory, CIPER, Faculty of Human Kinetics, University of Lisbon, Portugal*

<sup>2</sup> *Unité de Nutrition Humaine, INRA, Centre Clermont-Ferrand/Theix, France*

<sup>3</sup> *CIPER, Faculty of Human Kinetics, University of Lisbon, Portugal*

## Introduction

High intensity physical exercise is associated with accelerated reactive oxygen species (ROS) generation which may overwhelm the antioxidant defenses inducing macromolecular damage resulting in adverse effects on health. In spite of the very efficient antioxidant systems, nutritional habits may condition antioxidants availability as some antioxidant enzymes are dependent on nutritional factors (e.g. Se, Zn, Cu, Mn and Fe) and some of the non-enzymatic antioxidant are of exogenous sources (e.g. alpha-tocopherol, beta-carotene and ascorbate). The present study aimed to investigate the influence of subjects' training condition and exercise intensity on plasma alpha-tocopherol (P-VitE), and thiobarbituric reactive substances (P-TBARS).

## Methods

Fourteen high competition male swimmers (S) training between 17 and 23 h/week for at least 5 years, and 13 active men (AM) not involved in any regular sport activity participated in the study. They were all between 18 and 25 years old. Nutritional analysis was performed using a 3 days food record and body composition was assessed by DXA. Subjects performed a continuous graded maximal run on treadmill until O<sub>2</sub> uptake stabilization or exhaustion, with expired gas analysis and heart rate motorization (maximal exercise - ME), and a 30 min run on treadmill at 70-75 % of maximal heart rate (submaximal exercise - SME) 48 h apart. Blood was collected before, just after and 2 hours after the exercise tests for P-VitE, P-TBARS and total cholesterol (TC). Values just after the exercise tests were corrected for plasma volume variation (PVV) and the ratios P-VitE/TC and P-TBARS/TC were calculated.

## Results

As expected, swimmers showed higher VO<sub>2</sub>max, VO<sub>2</sub>ANAT, fat free mass and appendicular muscle mass and lower fat mass. Nutritional analysis revealed similar food intake between the two groups. Retinol, alpha-tocopherol and folate intakes were under the RDIs. P-VitE was not correlated with alpha-tocopherol intake. No effect of training was observed, with S and AM showing similar P-VitE and P-TBARS values in all the moments of evaluation. P-VitE, but not P-VitE/TC, increased and P-TBARS and P-TBARS/TC decreased just after the ME. P-VitE was still high 2h later. No changes were observed after the SME.

## Conclusions

Although the level of training of the subjects did not affect the results, ME, but not SME, seems to elicit the mobilization of VitE from stores which may contribute to increase the antioxidant capacity of plasma resulting in the reduction of P-TBARS.

**Keywords:** Training; Exercise Intensity; alpha-tocopherol; TBARS.

## 4. INFANTS' PHYSIOLOGICAL RESPONSE TO FOUR MONTHS OF A SWIMMING PROGRAM

Ramos A.<sup>1</sup>, Marinho D.A.<sup>1,4</sup>, Barbosa T.M.<sup>2,4</sup>, Costa M.J.<sup>3,4</sup>

<sup>1</sup>University of Beira Interior, Portugal

<sup>2</sup>Nanyang Technological University, Singapore

<sup>3</sup>Polytechnic Institute of Guarda, Portugal

<sup>4</sup>Research Centre in Sports, Health and Human Development (CIDESD), Portugal

### Introduction

Infants' participation in aquatic activities increased remarkably in the last few years. Decreases in drowning chances, improved motor skills, and social development are underlying reasons for parents to include their children on swimming sessions. However, studies on the acute physiological responses to water routines over infancy are few (e.g. Martins et al., 2010). The aim of this study was to compare the infant's physiological response before and after a swimming program.

### Methods

Fourteen infants (36±5.08 months-old) were recruited to participate on this study. Infants had at least 9.71±5.14 months of experience in weekly aquatic sessions. They were tested before (M1) and 4 months after (M2) a swimming program. The physiological response was assessed based on heart rate measurements (HR, bpm). A heart rate monitor (Polar S220, Finland) adjusted around the infant's chest showed heart rate data at the smallest frequency (1 Hz). Water tasks comprised: (i) individual displacement in prone position (InD); (ii) accompanied displacement in prone position (AcD); (iii) immersion (Im); (iv) jump from the deck (JD) and; (v) sliding from the platform (Sli). Wilcoxon signed rank test was used to assess differences between evaluation moments ( $p \leq 0.05$ ).

### Results

HR values decreased in most of the water tasks at the end of the program (InD<sub>M1</sub>=141.43±12.62, InD<sub>M2</sub>=131.14±11.02,  $p=0.01$ ; Im<sub>M1</sub>=134.86±11.74, Im<sub>M2</sub>=119.57±12.84,  $p=0.01$ ; JD<sub>M1</sub>=133.14±13.20, JD<sub>M2</sub>=121.14±8.72,  $p=0.02$ ; Sli<sub>M1</sub>=137.29±11.17, Sli<sub>M2</sub>=132.79±8.67,  $p=0.05$ ). The only exception was for the AcD, where HR remained unchanged (AcD<sub>M1</sub>=142.86±9.36, AcD<sub>M2</sub>=138.07±12.96,  $p=0.12$ ).

### Discussion

Our findings suggest that infants experience significant physiological adaptations while participating on a swimming program. The HR decrease indicates that less physical energy is necessary to have success in water tasks. Under certain conditions, is expected that adrenocortical system of the infant rapidly habituates or attenuates its response with repeated exposures to the same event or context (Gunnar, 1989). So, HR decreases may also indicate a less stressful behaviour while performing the water tasks mainly due to this regular exposure to swimming sessions.

### References

- Gunnar MR. Studies of the human infant's adrenocortical response to potentially stressful events. *New Dir Child Dev.* 1989;(45):3-18.
- Martins M, Silva AJ, Marinho DA, Pereira AL, Moreira A, Sarmento P, Barbosa TM. Assessment of heart rate during infant's swim session. *Int SportMed J.* 2010; 11(3):336-344.

**Keywords:** Infants; Swimming; Physiological response.

## 6. MODELING PERFORMANCE AND BIOMECHANICS IN YOUNG SWIMMERS

Jorge E Morais<sup>1,2</sup>, Pedro Forte<sup>2</sup>, Mário J Costa<sup>1,3</sup>, Daniel A Marinho<sup>1,4</sup>, Nuno D Garrido<sup>1,5</sup>, António J Silva<sup>1,5</sup>, Tiago M Barbosa<sup>1,6</sup>

<sup>1</sup>Research Centre in Sports, Health and Human Development, Portugal

<sup>2</sup>Polytechnic Institute of Bragança, Portugal

<sup>3</sup>Polytechnic Institute of Guarda, Portugal

<sup>4</sup>University of Beira Interior, Portugal

<sup>5</sup>University of Trás-os-Montes and Alto Douro, Portugal

<sup>6</sup>Nanyang Technological University, Singapore

### Introduction

The main aim of this study was to model a latent growth curve of young swimmers' performance and biomechanics over two competitive seasons.

### Methods

The sample was composed by thirty young swimmers (14 boys:  $12.33 \pm 0.65$  years; and 16 girls:  $11.15 \pm 0.55$  years; all swimmers in Tanner stages 1-2 by self-report). The swimmers are part of a national talent identification and follow-up project. At the beginning of the assessment the swimmers had  $3.56 \pm 0.47$  years of training experience.

Repeated measures of the performance (100-m freestyle) and biomechanics: anthropometric (trunk transverse surface area), kinematic (stroke frequency, stroke length, swimming velocity and speed fluctuation), hydrodynamic (active drag and coefficient of active drag) and efficiency (stroke index and propelling efficiency) variables were collected in seven different moments (M) over two competitive seasons (i.e. longitudinal research). Latent growth curve modeling was computed to understand the longitudinal variation of performance (dependent variable) over the season according to the biomechanical determinants (independent variables).

### Results

Latent growth curve modeling showed a high inter- and intra-subject variability in the performance growth (slope:  $P < 0.001$ ) and at the baseline (intercept:  $P < 0.001$ ) in all models. Gender had a significant effect ( $P < 0.05$ ) during the performance growth for the models including the stroke length, speed fluctuation, stroke index, active drag and active drag coefficient. As for the intercept no-significant paths were found in all models. In the first season (i.e. M1, M2 and M3) the active drag was the main determinant factor for the performance improvement (M1:  $\beta = -0.20$ ,  $P < 0.05$ ; M2:  $\beta = -0.14$ ,  $P < 0.05$ ; and M3:  $\beta = -0.26$ ,  $P < 0.001$ ). In the second season, the swimming velocity was the main responsible in all moments (M4:  $\beta = -0.16$ ,  $P < 0.05$ ; M5:  $\beta = -0.48$ ,  $P < 0.001$ ; M6:  $\beta = -0.42$ ,  $P < 0.001$ ; and M7:  $\beta = -0.49$ ,  $P < 0.001$ ). All models had a reasonable adjustment. The models' good-of-fit ranged between  $\chi^2/df = 2.01$  (active drag coefficient model) and  $\chi^2/df = 4.71$  (swimming velocity model).

### Conclusion

Latent modeling is a comprehensive way of gathering insight about young swimmers' performance over time. All variables had at least in one moment a significant contribution to the performance. Different variables were the main responsible factor for the performance improvement (i.e. active drag and swimming velocity, respectively). A gender gap was found in the performance growth curve along with an intra- and inter-subject variability.

**Acknowledgement:** Jorge E Morais would like to acknowledge to the Portuguese Science and Technology Foundation (FCT) for the PhD scholarship (SFRH/BD/76287/2011).

**Keywords:** performance; kinematics; hydrodynamics; anthropometrics.

## 8. MAGNESIUM AND PHASE ANGLE: A PROGNOSTIC TOOL IN CELLULAR INTEGRITY OF JUDO ATHLETES

Laires M.J.<sup>1</sup>, Matias, C.N.<sup>2</sup>, Monteiro C.P.<sup>1</sup>, Santos, D.A.<sup>2</sup>, Martins, F.<sup>3</sup>, Sardinha, L.B.<sup>2</sup>, Silva, A.M.<sup>2</sup>

<sup>1</sup>Physiology and Biochemistry of Exercise Lab., CIPER, Faculty of Human Kinetics, University of Lisbon, Portugal

<sup>2</sup>Exercise and Health Lab., CIPER, Faculty of Human Kinetics, University of Lisbon, Portugal

<sup>3</sup>Immunology Lab., National Institute of Health Dr. Ricardo Jorge, Portugal

### Introduction

Adequate magnesium (Mg) levels are required to sustain appropriate performance levels, due to its important role in the membrane excitability, cell contractibility and metabolism, therefore being a key nutrient to sustain appropriate muscular contraction and performance levels, in athletes. The phase angle (PhA) measurement is used as the parameter of interest obtained from bioelectrical impedance analysis (BIA) because it is independent of body height and weight, as it is a direct measure of reactance to resistance ratio. PhA has been reported to be positively associated with most of the nutritional markers and as an indicator of the membrane integrity and water distribution between intra- and extracellular spaces. The water pools distribution between the intra and the extracellular compartment in athletes has been recently shown to be associated with a decrease in performance. The aim of the present study was to verify the association between Mg and PhA as a predictor of cellular health, in a sample of judo athletes from a period of weight stability to prior competition.

### Methods

Judo athletes (n=20) from the national team were evaluated at two moments: a period of body weight (BW) stability (M1) and prior to competition (M2). Changes between moments were calculated as M2-M1. Athletes were also split into groups according to BW changes: group A: weight lost < 2.0% (n=12) and group B: weight lost ≥ 2.0% (n=8). PhA was obtained by bioelectrical impedance spectroscopy at a 50 KHz frequency. Mg was measured in serum and red blood cells (RBC) by atomic absorption spectrophotometry and Mg from the diet was assessed from a 24-h diet record during a 7-day period, after the assessment of body composition.

### Results

PhA was not different from M1 to M2 in whole sample neither inside BW groups. In the whole sample, changes in PhA was directly associated with changes in serum and RBC Mg. Regarding BW groups, a direct association was observed between changes in PhA and changes in diet Mg, serum and RBC Mg in group B. Diet Mg was adjusted for energy intake and the association remained significant.

### Conclusions

The observed associations, specifically in the group that lost ≥ 2.0% BW are probably due to the fact that their diet is a limitation factor of the micronutrient achievement, probably translating in an alteration of the Mg status in the tissues and therefore in the general health state of the athlete. These results reinforce the previously reported information that PhA may be an indirect indicator of the muscular function.

**Keywords:** Magnesium; Athletes; Phase Angle; Bioelectrical impedance.

## 9. 2000m ALL-OUT AND TIME SUSTAINED AT 100% OF VO<sub>2</sub>MAX INTENSITY IN ROWING ERGOMETER EXERCISE

Ana Sousa <sup>1</sup>, Eduardo Oliveira <sup>1</sup>, João Paulo Vilas-Boas <sup>1,2</sup>, Ricardo J. Fernandes <sup>1,2</sup>

<sup>1</sup> CIFI<sup>2</sup>D, Faculty of Sport, University of Porto, Porto, Portugal

<sup>2</sup> LABIOME<sup>2</sup>P, University of Porto, Porto, Portugal

### Introduction

Physiological determinants of performance in 2000m ergometer rowing exercise are well described (Ingham, Pringle, Hardman, Fudge, & Richmond, 2013). However, the association between this distance and the time sustained at 100% of maximal oxygen uptake (VO<sub>2max</sub>) has not been addressed.

### Methods

Five nationally ranked highly trained male subjects (mean ± SD; age: 21.5 ± 2.5 yrs, height: 180.2 ± 5.1 cm and body mass: 73.5 ± 2.6 kg) performed, in a rowing ergometer (Concept II, Model D, CTS, Inc.), 2 experiments: (1) a square wave transition exercise at 100% of VO<sub>2max</sub> intensity (100% test - previously determined 24-48h before through an incremental protocol), and (2) a 2000m all-out exercise (2000 test). Ventilatory parameters and energy metabolic contributions were assessed as previously described (Sousa, Vilas-Boas, & Fernandes, 2014).

### Results

Table 1 shows the mean ± SD values for the ventilatory, performance and energy metabolic contribution parameters, with similar values observed for the VO<sub>2peak</sub> and HR<sub>peak</sub> between tests. The [La<sup>-</sup>]<sub>peak</sub>, TP and Aer contribution were higher in the 2000 test, in opposition with the remaining parameters – MPO, Ana<sub>lac</sub> and Ana<sub>alac</sub>. The VO<sub>2peak</sub> at 100% test was the unique studied predictor of TP in the 2000 test (R = 0.93, R<sup>2</sup> = 0.88, p < 0.05).

**Table 1:** Mean ± SD values for VO<sub>2peak</sub>, [La<sup>-</sup>]<sub>peak</sub>, HR<sub>peak</sub>, MPO, TP, Aer, Ana<sub>lac</sub> and Ana<sub>alac</sub> obtained at the 2000 and 100% tests (n=5).

Test	VO <sub>2peak</sub> ml.kg <sup>-1</sup> .min <sup>-1</sup>	[La <sup>-</sup> ] <sub>peak</sub> mmol.l <sup>-1</sup>	HR <sub>peak</sub> beats.min <sup>-1</sup>	MPO (W)	TP (s)	Aer %	Ana <sub>lac</sub> %	Ana <sub>alac</sub> %
2000	69.2±1.4	13.9±1.5 *	184.2±10.6	372±13 *	392±5 *	85.8±0.7 *	9.30±0.7 *	4.9±0.2 *
100%	66.7±1.9	10.4±1.1	184.1±9.9	398±11	228±57	80.1±2.9	11.7±2.1	8.5±1.7

VO<sub>2peak</sub> = peak oxygen uptake; [La<sup>-</sup>]<sub>peak</sub> = peak blood lactate concentration; HR<sub>peak</sub> = peak heart rate; MPO = Mean power output; TP = time performed; Aer, Ana<sub>lac</sub> and Ana<sub>alac</sub> = aerobic, anaerobic lactic and anaerobic alactic contributions, respectively. Differences between tests are identified by \* (p≤0.05).

### Conclusion

The MPO at VO<sub>2max</sub> (achieved in an incremental protocol) has been reported as the strongest correlates of 2000 test (Ingham et al., 2013), however, we found that the subjects with higher VO<sub>2peak</sub> at 100% test were the ones that performed worst in the 2000 test. This suggests that other factors, such as the VO<sub>2</sub> kinetics, may concur as a key variable to a more efficient performance in both tests.

**Acknowledgement:** PhD grant SFRH/BD/72610/2010.

### References

- Ingham, S. A., Pringle, J. S., Hardman, S. L., Fudge, B. W., & Richmond, V. L. (2013). Comparison of Step-Wise and Ramp-Wise Incremental Rowing Exercise Tests and 2000-m Rowing Ergometer Performance. *International journal of sports physiology and performance*, 8(2), 123.
- Sousa, A. C., Vilas-Boas, J., & Fernandes, R. J. (2014). Kinetics and Metabolic Contributions Whilst Swimming at 95, 100, and 105% of the Velocity at. *BioMed Research International*, 2014, 9. doi: 10.1155/2014/675363.

**Keywords:** Rowing; 2000m; VO<sub>2max</sub>; Time Sustained.

## 24. POST WARM-UP RECOVERY AND PERFORMANCE IN SWIMMING

Henrique Neiva<sup>1</sup>, Mário Marques<sup>1</sup>, Tiago Barbosa<sup>2</sup>, Fábio Pereira<sup>3</sup>, Daniel Marinho<sup>1</sup>

*Department of Sport Sciences - University of Beira Interior, Covilhã, Portugal  
National Institute of Education, Nanyang Technological University, Singapore  
Condelaizer Lda/ Clube Fluvial Vilacondense, Portugal*

### Introduction

The active warm-up in swimming seems to improve the performance with periods of recovery up to 20 min (Zochowski et al., 2007; West et al., 2013). After this period of time, the body temperature decreases at higher pace impairing the effects of warm-up and likewise the swimming performance (West et al., 2013). However, the literature only focuses on the effects of different intervals in the 200m swimming event, and the various competitive distances and techniques could demand different recovery. Thus, it was our purpose to analyze the effect of two different warm-up recoveries in 100m freestyle performance.

### Methods

Five male swimmers ( $16.40 \pm 1.67$  yrs) of national level participated in this study. On separate days, each swimmer performed 100m freestyle at maximal intensity, which was preceded by two different post warm-up recoveries (10 or 20 min). It was implemented the same warm-up, that totaled 1200m and included some of the habitual procedures. Performance (trial time), physiological (capillary blood lactate concentrations and heart rate), psychophysiological (perceived exertion) were assessed on both trials.

### Results

The 100m performance was fastest when using a 10 min of recovery after warm-up ( $59.84 \pm 1.38$  vs.  $60.63 \pm 1.34$  s;  $p=0.04$ ). Also, this period of recovery enables the swimmers to accomplish the trial at lower heart rate values ( $162.40 \pm 17.70$  vs.  $169.40 \pm 13.26$  bpm;  $p=0.04$ ). Notwithstanding these results, no differences were verified between 10 and 20 min post warm-up period in peak lactate concentration ( $9.02 \pm 3.17$  vs.  $8.30 \pm 2.9$  mmol/L;  $p=0.42$ ) and in the ratings of perceived exertion ( $18.60 \pm 1.34$  vs.  $18.4 \pm 0.89$ ;  $p=0.65$ ) after the trial.

### Conclusion

The recovery period after warm-up had an effect on the 100 m performance. Our results demonstrated that a 10 min post warm-up recovery period will help the swimmers to enhance the 100m freestyle performances. Although we failed to observe differences in the ratings of perceived exertion, the lower heart rate values after trial could indicate less effort during the trial in this condition. These results reveals the importance of prescribing the warm-up immediately before the race to benefit from all its positive effects.

**Acknowledgement:** This work was supported by a grant from the Science and Technology Foundation (SFRH/BD/74950/2010), by University of Beira Interior and Santander Totta bank (UBI/FCSH/Santander/2010) and by CIDESD Research and Development Miniprojects 2014.

### References

- Zochowski, T., Johnson, E., & Sleivert, G.G. (2007). Effects of varying post-warm-up recovery time on 200 m time trial swim performance. *International Journal of Sports Physiology and Performance*, 2(2), 201–211
- West, D.J., Dietzig, B.M., Bracken, R.M., Cunningham, D.J., Crewther, B.T., Cook, C.J., & Kilduff, L.P. (2013). Influence of post-warm-up recovery time on swim performance in international swimmers. *Journal of Science and Medicine in Sport*, 16(2), 172-6

**Keywords:** Swimming; Warm-up; Performance.

# 31. PÉRDIDA DE FUERZA DINÁMICA MÁXIMA TRAS UNA ACCIÓN EXCÉNTRICA

Oswaldo Costa Moreira<sup>1</sup>, Alex Amaral Gomes Silva<sup>2</sup>, Hiago Leandro Rodrigues de Souza<sup>2</sup>, Sandro Fernandes da Silva<sup>2</sup>, Claudia Eliza Patrocínio de Oliveira<sup>1</sup>

<sup>1</sup>Instituto de Biomedicina – Universidad de León – León, España

<sup>2</sup>Grupo de Estudo e Pesquisa em Respostas Neuromusculares – GEPREN- Universidade Federal de Lavras – UFLA, Brasil

## Introducción

La contracción muscular excéntrica presenta características únicas en el proceso de adaptación neuromuscular (Cadore *et al.*, 2014), así, muchos experimentos demuestran que la contracción excéntrica sería el principal estímulo para promover el aumento de la fuerza y de la hipertrofia muscular (De Souza-Teixeira e De Paz, 2012). Así, la presente investigación tuvo como objetivo investigar la influencia de la acción muscular excéntrica en la fuerza muscular dinámica máxima.

## Métodos

La muestra fue compuesta por 9 voluntarias del sexo femenino ( $22 \pm 1,8$  años;  $1,71 \pm 3,96$  m;  $68,3 \pm 12,94$  kg;  $32,12 \pm 6,30$  % grasa), todas ellas jugadoras de la equipe de voleibol de la Universidad Federal de Lavras. En un primer momento fueron hechas investigaciones antropométricas y de la fuerza muscular dinámica máxima (1RM). En un segundo momento fue realizada 3 series con 60% de la carga de 1RM con énfasis en la fase excéntrica del movimiento, en que las voluntarias fueron orientadas a realizar el mayor número de repeticiones posibles, con un descanso de 90 segundos entre las series. Después de 72 horas fue hecha una nueva recolección de la fuerza dinámica máxima. Para verificar la distribución de la muestra fue adoptado el test de Shapiro-Wilk. Para la comprobación de la fuerza muscular dinámica máxima pre y pos acción excéntrica fue adoptado el test nao paramétrico de Wilcoxon. Para comprobación estadística fue utilizado un nivel de significancia de  $p \leq 0,05$ .

## Resultados

La fuerza muscular el primer momento fue de  $103,33 \pm 20,61$  kg, tras 72 horas de reposo la fuerza bajo para  $97,77 \pm 15,63$ , esa disminución no represento una diferencia significativa, pero hubo una reducción de 6,40% en la fuerza dinámica máxima ejecutada.

## Conclusión

A pesar de haber encontrado diferencias significativas, los resultados muestran una disminución en la fuerza dinámica máxima en ese grupo, así es recomendable una cierta precaución en la prescripción del ejercicio con énfasis en la acción excéntrica en periodos próximos a la competencia.

## Referencias

CADORE, E. *et al.* Muscle conduction velocity, strength, neural activity, and morphological changes after eccentric and concentric training. *Scandinavian journal of medicine & science in sports*, 2014. ISSN 1600-0838.  
DE SOUZA-TEIXEIRA, F.; DE PAZ, J. Eccentric Resistance Training and Muscle Hypertrophy. *J Sport Medic Doping Studie S*, v. 1, p. 2161-0673, 2012.

**Keywords:** Fuerza; Entrenamiento excéntrico; Mujeres.



# 38. RELIABILITY AND CONSTRUCT VALIDITY OF YO-YO INTERMITTENT TESTS IN UNTRAINED AND FOOTBALL TRAINED PUPILS

Susana Póvoas<sup>1</sup>, Carlo Castagna<sup>2</sup>, Mariana Lopes<sup>3</sup> and Peter Krstrup<sup>4</sup>

<sup>1</sup>Maia University Institute - Ismai, CIDAF, Maia, CIDESD, Vila Real, Portugal

<sup>2</sup>School of Sport and Exercise Sciences, Faculty of Medicine and Surgery, University of Rome Tor Vergata, Rome, Italy

<sup>3</sup>Maia University Institute - Ismai, Maia, Portugal

<sup>4</sup>Copenhagen Centre for Team Sport and Health, University of Copenhagen, Dk, College of Life and Environmental Sciences, University of Exeter, Exeter, UK

## Introduction

The Yo-Yo intermittent tests are simple, inexpensive and allow testing numerous participants at the same time and, in team sports, performance in these tests is closely correlated with the amount of high-intensity running during the matches. Though these tests have been widely used, the test-retest reproducibility of the Yo-Yo intermittent tests in relation to test performance and HRpeak and the ability to discriminate between untrained and football trained girls and boys have not been established for ages 9-16. Thus, the present examined the test-retest reproducibility and construct validity of three Yo-Yo intermittent tests in untrained and football trained age-matched girls and boys aged 9-16.

## Methods

The participants (n=315) performed Yo-Yo intermittent tests according to their age group (YYIR1C: 9-11-year-olds; YYIE1: 12-13-year-olds and YYIE2: 14-16 year-olds) within 7 days to register the test-retest reproducibility. Total distance covered and peak heart rate (HRpeak) were determined. Coefficient of variance (CV), intraclass correlation coefficient (ICC) with 95% confidence intervals (95% CI), Student's unpaired t-test and Bland-Altman plots with the limits of agreement were used.

## Results

The Yo-Yo intermittent test-retest CV for distance covered was 12±9, 10±9 and 13±12% for the football trained group aged 9-11, 12-13 and 14-16, respectively, with corresponding values for the untrained group being 15±10, 19±13 and 14±10%. ICC values were considered mainly as excellent. Yo-Yo intermittent tests performance was 33% (897±508 vs. 599±218 m), 50% (1781±646 vs. 859±261 m) and 64% (1195±417 vs. 404±89 m) better (P≤0.01) for the football trained than the untrained group aged 9-11, 12-13 and 14-16, respectively. The Yo-Yo intermittent tests HRpeak was similar for the football trained and the untrained participants aged 9-11 (207±9 vs. 208±9 b.min<sup>-1</sup>), 12-13 (205±8 vs. 204±8 b.min<sup>-1</sup>) and 14-16 (200±9 vs. 201±9 b.min<sup>-1</sup>).

## Conclusion

Yo-Yo intermittent tests performance and HRpeak are reproducible for 9-16-year-old footballers and untrained girls and boys. Additionally, performances of the three Yo-Yo tests were seemingly better for the football trained than for the untrained participants, providing evidence of construct validity.

## References

Krstrup, P., Mohr, M., Amstrup, T., et al. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Med Sci Sports Exerc*, 35(4), 697-70.

**Keywords:** Yo-Yo Intermittent Recovery Level 1 Children's test; Yo-Yo Intermittent Endurance test Level 1; Yo-Yo Intermittent Endurance test Level 2.

## 39. EXCELLENCE IN ORIENTEERING: REPRESENTATION FROM ELITE COACHES

T. Celestino<sup>1</sup>, J. Leitão<sup>2</sup>, H. Sarmento<sup>3,4</sup>, A. Marques<sup>5</sup>, A. Pereira<sup>3</sup>

<sup>1</sup>University of Trás-os-Montes and Alto Douro, Vila Real, Portugal

<sup>2</sup>Research Center in Sports, Health Sciences and Human Development (CIDESD), University of Trás-os-Montes e Alto Douro, Vila Real, Portugal

<sup>3</sup>Centre for the Study of Education, Technologies and Health (CI&DETS), Polytechnic Institute of Viseu - School of Education, Viseu, Portugal

<sup>4</sup>Department of Sport Sciences and Physical Education - University Institute of Maia, Maia, Portugal

<sup>5</sup>Interdisciplinary Centre for the Study of Human Performance, Faculty of Human Kinetics, University of Lisbon, Portugal

### Introduction

The understanding of the human potential, and more specifically, of the phenomenon of excellence has been gaining more relevance in sport sciences. It has been a challenge for researchers to describe, understand and identify the factors, reasons and characteristics related with excellence. The aim of this study was to identify which factors were considered by elite orienteering coaches to be most relevant to distinguish excellent athletes in this sport.

### Methods

Data was collected via semi-structured interviews to a group of 10 elite orienteering coaches, who had participated in world championships. Data was later analyzed using content analysis method (Bardin, 2008).

### Results

The interviewees have showed that excellence is associated with skills, transcendence and overcoming obstacles, which are manifested through the athlete's performance levels during several years. Athletes were characterized by being highly motivated individuals, organized, perfectionists, ambitious and disciplined at the level of accomplishing and feeling satisfied with life and sports. Regarding the competences, coaches suggest the need to have a defensive attitude, great humbleness, dedication and commitment, intelligence and sociability.

### Conclusion

It was possible to conclude that excellence in orienteering should be conceptually understood as an evolving, regular and dynamic process. It is required harmonious management of the physical/physiological, psychological and cognitive components associated with a perfect understanding of the intellectual processes linked with orienteering. Considering this, accuracy is required, focus and emotional stability, moderated by high deontological moral and ethical values.

### References

Bardin, L. (2008). *Análise de conteúdo*. Lisboa: Edições 70.

**Keywords:** intense intermittent exercise performance; Yo-Yo Intermittent Recovery Level 1 Children's test; Yo-Yo Intermittent Endurance test Level 1; Yo-Yo Intermittent Endurance test Level 2

## 42. EFEITOS DE UM PROGRAMA DE TREINO DE FORÇA EXCÊNTRICO VS CONCÊNTRICO NA FORÇA, EQUILÍBRIO MUSCULAR DOS ROTADORES DOS OMBROS E VELOCIDADE DE REMATE EM JOVENS ANDEBOLISTAS

Nuno Batalha<sup>1,2</sup>, Pedro Galha<sup>1</sup>, Armando Raimundo<sup>1,2</sup>, José Parraça<sup>1,2</sup>, Pablo Tomas-Carus<sup>1,2</sup>

<sup>1</sup> Universidade de Évora, Escola de Ciência e Tecnologia, Departamento de Desporto e Saúde, Évora, Portugal

<sup>2</sup> CIDESD – Centro de investigação em Desporto, Saúde e Desenvolvimento Humano, Évora, Portugal

### Introdução

Nos principais gestos técnicos do andebol realizados com os membros superiores, a coifa dos rotadores tem uma ação de extrema importância, sendo a frenagem do movimento realizada através de contrações excêntricas dos rotadores externos (RE) (Escamilla and Andrews, 2009). O objectivo do estudo consistiu em avaliar o efeito de dois programas de treino (concêntrico vs excêntrico) na força e equilíbrio muscular dos músculos rotadores dos ombros e na performance ao nível do remate em jovens andebolistas.

### Metodologia

A amostra foi composta por andebolistas com idades entre os 12 e os 17 anos e organizada em três grupos: G. excêntrico (GE; N=9), G. concêntrico (GCC; N=9) e G. de controlo (GC; N=10). Os atletas foram avaliados em dois momentos, antes e após o programa de treino, em três parâmetros: i) força dos rotadores dos ombros recorrendo ao dinamómetro isocinético Biodex System 3 e utilizando dois protocolos – a força máxima em 3 execuções a 60°/s e a força resistente em 20 repetições a 180°/s –; ii) força de preensão palmar através do Hand Grip; iii) velocidade de saída da bola através da análise cinemática do remate. O programa de treino foi aplicado durante 12 semanas, três vezes por semana. Após aquecimento, os atletas realizaram 3 exercícios idênticos, um grupo com contração excêntrica e outro com ação concêntrica (3 séries de 15 repetições). Para além da estatística descritiva, os efeitos de treino foram estudados através de uma análise de variâncias ANOVA com medidas repetidas, relacionando os três grupos com dois momentos.

### Resultados

Na avaliação do Membro Dominante (MD) a 60°/s, o GCC aumentou significativamente os valores de força dos RE ( $p=0.005$ ), RI ( $p=0.031$ ) e rácios unilaterais ( $p=0.015$ ). O GE, apesar de apresentar aumentos de força e de equilíbrio muscular, apenas revelou diferenças significativas intra-grupo nos RE ( $p=0.025$ ). No Membro não dominante (MND) a tendência de aumento dos valores de força e equilíbrio muscular manteve-se em ambos os grupos, com valores significativos para o GE nos RE ( $p=0.008$ ) e em ambos os grupos para os rácios unilaterais ( $p=0.020$  e  $p=0.015$  para GE e GCC respetivamente). Nas avaliações da força resistente (180°/s), em ambos os membros e nos dois programas de treino, força dos RE e rácios unilaterais aumentaram significativamente, traduzindo um maior equilíbrio muscular. Neste caso, o treino concêntrico revelou-se mais eficaz no aumento da força dos RE e rácios, com diferenças significativas entre grupos ( $p=0.002$  para RE e  $p=0.001$  para rácios no MD;  $p=0.001$  para RE e  $p=0.007$  para rácios no MND). Na velocidade de saída da bola, existiram diferenças significativas entre grupos nos distintos tipos de remate. O treino concêntrico revelou-se mais eficaz no aumento da velocidade de saída da bola no remate em suspensão ( $p=0.001$ ), tendo o treino excêntrico melhores resultados na mesma variável do remate em apoio ( $p=0.002$ ).

### Conclusão

Ambos os programas de treino realizados contribuíram para o aumento dos níveis de força dos RI e RE, resultando num maior equilíbrio muscular. Ao nível da força resistente o treino concêntrico revelou-se mais eficaz no aumento efetivo do equilíbrio muscular. O treino concêntrico foi mais efetivo no aumento da velocidade de saída da bola no remate em suspensão, acontecendo o mesmo com o treino excêntrico para com o remate em apoio.

### Referencias

Escamilla, R. F., & Andrews, J. R. (2009). Shoulder muscle recruitment patterns and related biomechanics during upper extremity sports. *Sports Medicine*, 39, 569–590.

**Keywords:** Shoulder rotators; Isokinetic strength; Handball.

# 44. SEASONAL ADAPTATIONS IN THE PHYSICAL PERFORMANCE OF FUTSAL PLAYERS AND ITS EFFECTS ON DEFENSIVE SKILLS

Domingues D.<sup>1</sup>, Sampaio J.<sup>2,4</sup>, Fonseca T.<sup>1</sup>, Barbosa T.M.<sup>3,4</sup>, Costa M.J.<sup>1,4</sup>

<sup>1</sup>*Polytechnic Institute of Guarda, Portugal*

<sup>2</sup>*University of Trás-os-Montes and Alto Douro, Portugal*

<sup>3</sup>*Nanyang Technological University, Singapore*

<sup>4</sup>*Research Centre in Sports, Health and Human Development (CIDESD), Portugal*

## Introduction

A deeper insight about mechanistic adaptations to training is a key aspect to reach success in a futsal season. The body of knowledge on the topic is limited and just reports mostly heart rate and physical fitness changes over time (e.g. Oliveira et al., 2013). The aim of this study was to identify the seasonal adaptations of physical performances on futsal players and its effects on defensive skills.

## Methods

Eight competitive futsal players (age=24.5±5.17 years; height=175±6.12 cm; weight=69.7±8.4Kg) were monitored during training periods (M1= beginning of the pre-season; M2= mid of the first half season; M3 = mid of the second half season). A progressive shuttle-running test (Castagna and Barbero-Alvarez, 2010) was applied to collect physical variables: (i) maximal velocity (vmax, m/s) and (ii) distance covered in the test (d, m). Match-performance statistics were assessed using a computerised video-analysis system of three sets of an 8 min game. The defensive skills analysed were: (i) ball recoveries; (ii) interceptions; (iii) fouls committed, and; (iv) goals conceded. Wilcoxon signed rank test was used to assess differences between training periods ( $p \leq 0.05$ ).

## Results

The velocity (vmax<sub>M1</sub>=15.20±0.69, vmax<sub>M2</sub>=15.45±0.55, vmax<sub>M3</sub>=15.53±0.55,  $p=0.29$ ) and d (d<sub>M1</sub>=1095±140, d<sub>M2</sub>=1157±126, d<sub>M3</sub>=1166±134,  $p=0.14$ ) were similar. Non-significant differences were also identified for the game determinants, with the exception for ball recoveries, which increased from M1 to M3 (recoveries<sub>M1</sub>=2.00±1.12, recoveries<sub>M2</sub>=2.13±1.76, recoveries<sub>M3</sub>=3.25±0.97,  $p=0.05$ ).

## Discussion

Futsal played at high level is an intensity exercise heavily taxing the aerobic and anaerobic pathways. The physical parameters were much similar through the season, which sustains the hypothesis of small changes across the considered periods of the season (Sampaio et al., 2010). Increases in ball recoveries can be suggesting an adaptation to game energetic, muscular and perceptive demands though.

## References

- Castagna C, Barbero Alvarez JC. Physiological demands of an intermittent futsal-oriented high-intensity test. *J Strength Cond Res.* 2010; 24(9):2322-9.
- Oliveira RS, Leicht AS, Bishop D, Barbero-Álvarez JC, Nakamura FY. Seasonal changes in physical performance and heart rate variability in high level futsal players. *Int J Sports Med.* 2013; 34(5):424-30.
- Sampaio J, Drinkwater EJ, Leite NM. Effects of season period, team quality, and playing time on basketball players' game-related statistics. *Eur J Sport Sci.* 2010; 10(2): 141-149.

**Keywords:** training; team sports; performance.

# 45. THE EFFECT OF THE APPLICATION OF A PHYSICAL FITNESS PROGRAM BEFORE AND AFTER TECHNICAL/TACTICAL WORK IN TEAM SPORTS IN PHYSICAL EDUCATION

Teixeira, M.<sup>1</sup>, Gil, M.H.<sup>1,2</sup>, Sousa, A.<sup>1,2</sup>, Martins, J.<sup>1,2</sup>, Marques, M.C.<sup>1,2</sup>, Marinho, D.<sup>1,2</sup>

<sup>1</sup>Department of Sports Sciences, University of Beira Interior, Covilhã, Portugal  
<sup>2</sup>Research Centre for Sport, Health and Human Development, Vila Real, Portugal

## Introduction

The purpose of this study was to evaluate the effects of a physical activity program on physical fitness in adolescent students, trying to analyze the effect of the moment of application of the program in Physical Education.

## Methods

63 students participated in this study (age:  $16.48 \pm 1.05$  years), and were divided into three sample groups. Two experimental groups were subjected to six weeks of a training program for physical condition, and the G1 applied the program before the technical/tactical work and the G2 applied the program after (Martins et al., 2011). The control group did not perform any additional training beyond physical education classes. Both groups underwent two time points (pre and post-test), and the battery of tests used was the Fitnessgram, included the 30m Sprint and the Horizontal Jump tests. To analyze the effects of training program in each group we used the Wilcoxon testing, and to analyze the difference between groups we used the Kruskal-Wallis One Way Anova test and it was considered the level of significance  $p \leq 0.05$ .

## Results

The results of this study showed that both experimental groups (G1 and G2) showed significant improvements in physical condition after application of a physical fitness program with duration of 6 weeks, however G2 showed more significant improvement than G1. In turn, in the control group no significant improvements have been observed and in some parameters a performance decrease was noticed.

## Conclusion

Through this study we can conclude that the programs of physical condition lead to significant improvements in the physical condition of young adolescents, and these enhancements are more important when the training program is applied after physical education classes.

## References

Martins, J.C., Marialva, A.F., Afonso, M., Gameiro, N.F., Costa, A.M. (2011). Effects of an 8-week physical activity program on body composition and physical fitness on obese and pre obese female students. *Journal of Physical Education and Sport*, 11(2), 226-234.

**Keywords:** Training; Physical Fitness Program; Adolescent Students.

## 46. INFLUENCE OF STRENGTH, SPRINT RUNNING, AND COMBINED STRENGTH AND SPRINT RUNNING TRAINING ON SHORT SPRINT PERFORMANCE IN YOUNG ADULTS

Mário C. Marques<sup>1,2</sup>, António Sousa<sup>1,2</sup>, Tim J. Gabbett<sup>3,4</sup>, Luis Sánchez-Medina<sup>5</sup>, Roland van den Tillaar<sup>2,6</sup>, Mikel Izquierdo<sup>7</sup>, Daniel A. Marinho<sup>1,2</sup>

<sup>1</sup>Department of Sports Sciences, University of Beira Interior, Covilhã, Portugal

<sup>2</sup>Research Centre for Sport, Health and Human Development, Vila Real, Portugal

<sup>3</sup>School of Exercise Science, Australian Catholic University, Brisbane, Australia

<sup>4</sup>School of Human Movement Studies, The University of Queensland, Brisbane, Australia

<sup>5</sup>Studies, Research and Sports Medicine Centre, Pamplona, Spain

<sup>6</sup>Nord Trøndelag University College, Levanger, Norway

<sup>7</sup>Department of Health Sciences, Public University of Navarra, Pamplona, Spain

### Introduction

Force production and muscle power output enhancement are considered crucial for increasing sprint running performance (Sáez de Villarreal et al, 2013). The purpose of this study was to assess the degree of transference of full squat vs full squat plus sprint running training to short (0-30m) sprint running performance after six weeks. We hypothesized that a speed-full-squat training regimen could enhance squat strength and power with simultaneous improvements in short sprint performance.

### Methods

122 physical active students (age:  $20.5 \pm 2.5$  years; body mass:  $65.8 \pm 6.1$  kg; height:  $1.71 \pm 0.08$  m) were randomly divided into 4 groups: full squat training (n=36), combined full squat and sprint training (n=32), speed training only (n=34) and non-training control group (n=20). Each training group completed two sessions per week over 6 weeks, while the control group did not perform any specific physical activity. In statistical terms, to evaluate the performance changes within training groups a one-way ANOVA with repeated measures (pre-post test) for each exercise was performed. To identify differences in training effects between the different exercises a mixed design 4 (change in strength and sprint variables from pre- to post training test) x 4 groups analysis of variance (ANOVA) was used. The level of significance was set at  $p \leq 0.05$ .

### Results

Sprint performance was improved after sprint running or full squat training alone ( $P < 0.05$ ), however larger enhancements ( $P < 0.01$ ) were observed after the combined and full squat plus sprint training intervention.

### Conclusions

These results suggest that combined full squat and sprint training provides a greater stimulus for improving sprint performance than either modality alone in recreationally active students.

### References

Sáez de Villarreal, E., Requena, B., Izquierdo, M., Gonzalez-Badillo, J.J. (2013). Enhancing sprint and strength performance: Combined versus maximal power, traditional heavy-resistance and plyometric training. *Journal of Science and Medicine in Sport*, 16(2), 146-150.

**Keywords:** velocity, sprint, full-squat, transfer, combined training

## 48. POWER ASSESSMENT IN YOUNG MALE SOCCER GOALKEEPERS: VARIATION BY COMPETITIVE LEVEL

Rebelo-Gonçalves, R.<sup>1</sup>, Coelho-e-Silva, M.J.<sup>1</sup>, Tessitore, A.<sup>2</sup>, Figueiredo, A.J.<sup>1</sup>,

<sup>1</sup> Faculty of Sport Science and Physical Education, University of Coimbra, Portugal

<sup>2</sup> University of Rome, "Foro Italico", Italy

### Introduction

Soccer goalkeepers are supposed to perform moderate-to-vigorous intensity movements, consisting in the ability to generate several maximal short-term efforts. Furthermore, elite goalkeepers tended to present higher levels of lower-limb strength<sup>1</sup>. The current study was aimed to examine short-term muscle power outputs in young male soccer goalkeepers by competitive level (national *versus* regional).

### Methods

Training experience of thirty-six goalkeepers aged 12.73–18.67 was recorded. Stature, body mass, leg length, thigh volume, fat mass and fat-free mass (air-displacement plethysmography) were measured and biological maturation status assessed with maturity offset protocol. All subjects performed the Wingate Anaerobic Test (WAnT). The knee extensors and flexors peak torque were concentrically assessed by isokinetic dynamometry at 60° s<sup>-1</sup> and 180° s<sup>-1</sup>. Comparisons between regional and national players was performed controlling for age and discriminant function analysis used to identify the best correlates of competitive level.

### Results

A significant effect of competitive level was noted for training experience, peak power (expressed in it absolute and relative formats), absolute mean power, and knee flexion. When adjusted for the cofounder (chronological age), multivariate analysis of covariance revealed that years of training, peak power (absolute, relative do body mass and relative to fat-free mass), and performance in knee flexion differed between competitive groups. Results of the discriminant function analysis indicated a function of two variables: training experience and peak power expressed in watts per unit of fat-free- mass. The equation successfully predicted 78% of goalkeepers by competitive level.

### Conclusions

The present results highlight the importance of training experience, body size and peak power outputs in the goalkeepers variation by competitive level. These characteristics likely influence the selection and development of goalkeepers at young ages. However, it is not clear if the differences between national and regional goalkeepers were due to disparity selection criteria for the position, exposure to training, or some combination of both.

**Acknowledgements:** Project supported by *Fundação para a Ciência e Tecnologia* (SFRH/BD/72111/2010).

### References

<sup>1</sup> Rebelo A, Brito J, Maia J, Coelho-e-Silva MJ, Figueiredo AJ, Bangsbo J, Malina RM, Seabra A. Anthropometric Characteristics, Physical Fitness and Technical Performance of Under-19 Soccer Players by Competitive Level and Field Position. *International journal of sports medicine*. Oct 11 2012.

**Keywords:** anaerobic power; short-term maximal effort; cycle-ergometer; playing position.

## 53. ELECTROMYOGRAPHY IN SWIMMING PERFORMANCE: A REVIEW

Conceição, A.<sup>1,2</sup>; Silva, A.J.<sup>3,2</sup>; Barbosa, T.<sup>4</sup>; Louro, H.<sup>1,2</sup>

<sup>1</sup> Sport Sciences School of Rio Maior, Rio Maior, Portugal

<sup>2</sup> CIDESD- Research Center in Sports Sciences, Health and Human Development, Vila Real, Portugal

<sup>3</sup> University of Trás-os-Montes e Alto Douro, Vila Real, Portugal

<sup>4</sup> Nanyang Technological University, Singapura

### Introduction

A large quantity of investigation produced over several decades has been conducted to better understand the electromyography (EMG) in sport, specifically in swimming. EMG is one of the topics more attractive and growing within the science of swimming, due to the challenge to make data acquisition in aquatic environment. The main objectives of this study were to review: a) the contribution of EMG to overall swimming performance, b) the effects of the four swimming techniques in EMG and c) the application of EMG in swimming starts and turns.

### Methods

B-On, PubMed, Scopus, Google Scholar, ISI Web of Science, the proceedings of international congresses on biomechanics and swimming databases were also searched from 1961 to September 2014, using the combined keywords “swimming”, “swimmer”, “electromyography” (EMG). The inclusion criteria were: (1) containing EMG data on competitive swimming; (2) amateurs and/or elite swimmers of all ages, all swimming techniques; swimming starts and turns; and (3) the articles written in English and Portuguese. The exclusion criteria were: (1) papers with no EMG data; (2) publications in languages other than those used in the inclusion criteria.

### Results

From 36 studies found, a high variety of EMG methodologies were reported. With respect of the four swimming techniques, the front crawl is the most studied with 23 studies published, follow by breaststroke 7 studies, and butterfly and backstroke tied with 2 studies. Lastly, the starts with 1 and turns with 3 studies reported. The results showed similarities in the selection of the main muscles for each swimming technique, verifying that the muscles of upper limbs were the most studied. The signal processing undergoes a trend towards the use of spectral analyses instead of temporal/qualitative analyses.

### Conclusion

This review came to the conclusion that EMG in swimming can provide valid measurements in the domain of data acquisition approaches and signal processing, therefore, researchers should explore more the potential of this technique in starts and turns, towards to describe the muscle activation patterns and to evaluate timing parameters to characterize neuromuscular patterns responsible for an efficient movement.

### References

- Clarys, J.P.(1985). Hydrodynamics and electromyography: Ergonomics aspects in aquatics. *Applied Ergonomics*, 1, 6, 11-24.  
Conceição, A., Silva, A., Barbosa, T., Karsai, I., Louro, H. (2014). Neuromuscular Fatigue during 200m breaststroke, *Journal of Sports Science and Medicine*, 13: 200 - 210.

**Keywords:** Electromyography; Swimming; Performance.



# 55. ASSESSMENT OF ANAEROBIC PERFORMANCE IN YOUNG SWIMMERS USING LABORATORY AND SPORT SPECIFIC TESTS

Rodrigues-Ferreira, M. A., Vences Brito, A. M.

*Sport Sciences School of Rio Maior - Polytechnic Institute of Santarém, Rio Maior, Portugal*

## Introduction

The assessment of the anaerobic performance is important in young athletes, however the choice of the tests must meet scientific and practical aspects (Van Praagh, 2008). Thus, the aim of this study was to evaluate the anaerobic performance in young swimmers using one laboratory test and one sport specific test.

## Methods

The sample was composed by 13 young swimmers, 5 boys and 8 girls, (age,  $12.1 \pm 1.6$  yr.; height,  $158.1 \pm 9.9$  cm; weight,  $50.9 \pm 8.1$  kg), with an average of  $3.4 \pm 1.7$  years of training practice and competition. To assess the anaerobic performance in a laboratory test, participants performed the Wingate Anaerobic Test (WAnT) with the lower limbs (Monark 894E), against a resistance of  $0.74 \text{ N} \cdot \text{kg}^{-1}$  (McNarry *et al.*, 2011). The anaerobic critical velocity (AnCV) of 4 distances (10, 15, 20 e 25 m) in freestyle swimming was used to assess the anaerobic performance during a sport specific test (Marinho *et al.*, 2011). Normality of the data distribution, with Shapiro-Wilks test, was not assumed for the peak power output (PP) and mean power output (MP). To correlate the variables from the WAnT and the AnCV, the Spearman's rank correlation coefficient was used (SPSS, version 17.0).

## Results

The PP and MP were  $387.8 \pm 83.5$  and  $291.6 \pm 61.6$  W, respectively. The AnCV was  $1.36 \pm 0.2$ . It was observed a significant relationship between PP and AnCV ( $r=0.663$ ;  $p=0.014$ ) and between the MP and AnCV ( $r=0.704$ ;  $p=0.007$ ). Although, no significant relationship were observed when taking into account the body mass.

## Conclusion

Those results suggest that the WAnT could be a useful test for the assessment of the anaerobic performance in young swimmers, providing a general measure of the maximal anaerobic power and the ability to maintain that maximal power. However, the AnCV provides more useful information for the coach, giving information about the sport specific anaerobic performance. During the season, the coaches may use both laboratory (preparatory period) and field tests (competitive period) to assess the anaerobic performance of their athletes. This study is limited to the assessment of the anaerobic performance from the lower limbs in the laboratory test, and futures studies should focus on the analysis of the upper limb anaerobic performance.

## References

- Marinho, D. A., Amorim, R. A., Costa, A. M., Marques, M. C., Pérez-Turpin, J. A., & Neiva, H. P. (2011). "Anaerobic" critical velocity and swimming performance in young swimmers. *Journal of Human Sport and Exercise*, 6, 80-86.
- McNarry, M. A., Welsman, J. R., & Jones, A. M. (2011). The influence of training and maturity status on girls' responses to short-term, high-intensity upper- and lower-body exercise. *Applied Physiology, Nutrition, and Metabolism*, 36, 344-352.
- Van Praagh, E. (2008). Testing anaerobic performance. In H. Hebestreit & O. Bar-Or (Eds.), *The young athlete* (pp. 453-468). Oxford: Blackwell.

**Keywords:** Young athletes; Anaerobic performance; Training and testing.

# 58. CORTISOL, TESTOSTERONE AND MOOD STATE VARIATION DURING AN OFFICIAL FEMALE FOOTBALL COMPETITION

Casanova, N.<sup>1,7</sup>; Palmeira-de-Oliveira, A.<sup>2,3</sup>; Pereira, A.<sup>4,5</sup>; Crisóstomo, L.<sup>2,3</sup>; Travassos, B.<sup>5,6</sup>; Costa, A. M. <sup>3,5,6</sup>

<sup>1</sup> Department of Sports, Polytechnic Institute of Guarda, Guarda, Portugal;

<sup>2</sup> Faculty of Health Sciences, University of Beira Interior, Covilhã, Portugal

<sup>3</sup>CICS-UBI Health Sciences Investigation Center, University of Beira Interior, Portugal

<sup>4</sup>Department of Science and Technology, Polytechnic Institute of Setúbal, Portugal

<sup>5</sup>Research Center for Sport, Health and Human Development (CIDESD), Portugal

<sup>6</sup> Department of Sport Sciences, University of Beira Interior, Portugal

<sup>7</sup>Research Unit for Inland Development, Polytechnic Institute of Guarda, Guarda, Portugal

## Introduction

Endogenous hormones are essential on the control of physiological reactions and adaptations during sport performance. They also influence the recovery phase after exercise by modulating anabolic and catabolic processes. This study aims to compare the mood state and the salivary levels of cortisol and testosterone during an official female association football tournament (Algarve Cup 2012).

## Methods

Sixteen female football players ( $22.85 \pm 4.2$  yrs) from the Portuguese women's national team were included in the study. Mood, salivary cortisol and testosterone levels were examined in five moments over the championship (M1, neutral measures three days following the first match; M2-M5, on every match day). Saliva samples were collected before breakfast and immediately after each match. Mood was measured by the profile of mood states questionnaire (POMS) in M1 and after each match (M2-M5); hormone levels were measure by immunoassay methods using the Salimetrics® kit (testosterone, Salimetrics Europe, UK) and the Elecsys Cobas® test (cortisol, Roche Diagnosis GmbH).

## Results

Iceberg Profiles of POMS were observed during all the moments of evaluation (M2-M5), showing a decrease in vigor and an increase in tension and depression in both team defeats (M2 and M5). However there is no relationship between the hormones levels and the outcome of the competition, once cortisol and testosterone decrease from pre-match to post-match in both wins (M2 and M5) and defeats (M3 and M4). For testosterone the observed decrease is significantly different ( $p < 0.05$ ) before and after all matches.

## Discussion

Our results show a pattern in mood states behavior, being the positive subscale higher in the wins and the tension and depression higher in defeats. These results are in accordance with other studies (Filaire et al., 2011; Oliveira et al., 2009). Both cortisol and testosterone decrease after match and throughout the tournament, independently of the match outcome. The absence of hormone fluctuations related to competition performance points out that top-level professional football players training systematically and regularly seem to be very well adapted to competition stress effect.

## References

Filaire E, Bernain X, Sagnol L, Lac G (2011). Preliminary results on mood state, salivary testosterone: cortisol ratio and team performance in a professional soccer team. *Eur J Appl Physiol* (86), 179-184.

Oliveira T, Gouveia M, Oliveira R (2009). Testosterone, responsiveness to winning and losing experience in female soccer players. *Psychoneuroendocrinology* (34), 1056-1064.

**Keywords:** Mood State; Hormones; Competition.

## 60. ANAEROBIC ENERGY RELEASE DURING VARIOUS RESISTANCE EXERCISES PERFORMED AT 80% 1-RM

Victor M Reis <sup>1</sup>, Tiago M. Barbosa <sup>1</sup>, Mario J. Costa<sup>1</sup>, J Vilaça-Alves<sup>1</sup>, Cláudio Rosa<sup>2</sup>, Christopher Scott<sup>3</sup>

<sup>1</sup> Research Centre in Sports, Health & Human Development, Vila Real, Portugal

<sup>2</sup> University of Trás-os-Montes & Alto Douro, Vila Real, Portugal

<sup>3</sup> University of Southern Maine, USA

### Introduction

The need to assess the energy cost of isolated resistance exercises (RE) separating the aerobic and anaerobic fractions of energy release is documented in the literature (Reis et al., 2011).

### Methods

A total of 48 males ( $27.5 \pm 4.9$  years,  $1.78 \pm 0.06$  m height,  $791 \pm 10.4$  kg body mass and  $11.4 \pm 4.1$  % estimated body fat) were selected for this study. The subjects were divided into 4 groups and two exercises were assigned to each group of subjects. The subjects performed several 5-min constant-intensity exercise at four intensities were used: 12%, 16%, 20% and 24% 1-RM. After (48 hour later) the subjects performed exhaustive bouts at 80% 1-RM in the same exercises: horizontal bench press (BP), inclined BP, 1/2 squat, leg press, leg extension, latt pull down, biceps curl and triceps extension. During exercise expired gas was measured continuously by open air circuit analyzer (COSMED® K4b<sup>2</sup>, Rome, Italy). The mean values of  $\text{VO}_2$  at the last 30 s of exercise at 12, 16, 20 and 24 % 1-RM bouts were plotted against relative intensity in a simple linear regression mode. The regressions were then used to predict  $\text{O}_2$  demand for the higher intensity (80% 1-RM). Anaerobic energy release was calculated by the accumulated oxygen deficit (AOD) method, as explained elsewhere (Reis et al., 2010).

### Results

Figure 1 depicts the results.

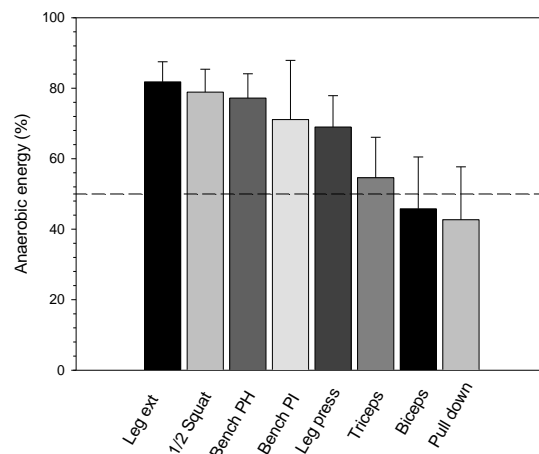


Figure 1: Anaerobic fraction of energy release at the 80% 1-RM bout in the eight different exercises. The 50% reference line is shown.

### Conclusion

It was concluded that even at a high intensity, RE of the upper limbs may be mainly aerobic whereas those of the lower limbs are evidently anaerobic.

### References

- Reis, V.M., Simão, R., Zajac, A., Oliveira, D.R. (2011). Energy cost of resistance exercises : an update. *Journal of Human Kinetics*, 1 (suppl), 33-40.
- Reis, V.M., Marinho, D.A, Policarpo, F.B., Carneiro, A.L., Baldari, C., Silva, A.J. (2010). Examining the accumulated oxygen deficit method in front crawl swimming, *International Journal of Sports Medicine*, 31, 421-427.

**Keywords:** Physiology; Training; Strength.

# 61. INCREMENTO DA FORÇA E DA POTÊNCIA MUSCULAR NO CONTEXTO DAS AULAS DE EDUCAÇÃO FÍSICA

Carvalho, C.<sup>1,2</sup> Gonçalves, F.<sup>1,2</sup> Vieira, L.<sup>1,2</sup> Carvalho, A.<sup>1,2</sup> Dias, I.<sup>1,2</sup> Silva, A.J.<sup>1,3</sup> Mourão, I.<sup>1,3</sup> Coelho, E.<sup>1,3</sup> Rodrigues, N.<sup>1,2</sup> & Duarte, A. M.<sup>1,2</sup>

<sup>1</sup>Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano (CIDESD)

<sup>2</sup>Instituto Universitário da Maia (ISMAI)

<sup>3</sup>Universidade de Trás-os-Montes e Alto Douro (UTAD)

## Introdução

O conhecimento acerca da treinabilidade da força nas crianças e adolescentes é bastante escassa, e muito mais o é, no enquadramento escolar. Existem, no entanto, evidências científicas que indicam que as crianças e os adolescentes podem aumentar a sua força muscular quando submetidos a programas de treino de intensidade, volume e duração suficientes (Behm *et al.* 2008; Faigenbaum & Myer, 2010). O presente estudo tem por objetivos verificar se (i) a capacidade de força é passível de ser melhorada no contexto escolar; (ii) alterações qualitativas do processo de treino conduzem a ganhos de treino diferenciados e, (iii) os ganhos de força conseguidos pelos rapazes e pelas raparigas após programas de treino de força são semelhantes.

## Método

Os participantes neste estudo foram 96 alunos do 12º ano da Escola Secundária de Monção, divididos em dois grupos: um de controlo (n=28) e um experimental (n=68). A avaliação foi realizada com os testes *push-up* 60", *curl-up* 30", lançamento da BM de 2kg, sêxtuplo, impulsão horizontal e 30m de *sprint*. O programa de treino era constituído por: elevação de gémeos, afundos, semi-agachamento, supino, *butterfly*, remo vertical, *burpees*, balanços com *kettlebell*, abdominais e lombares (2 séries de ≈15 repetições a ca. 60% 1 RM durante 30" e 60" descanso). O programa de treino teve a duração de 9 semanas realizando-se 2x semana. Utilizamos medidas descritivas e comparativas (Teste *t* para amostras emparelhadas e para amostras independentes).

## Resultados

A percentagem de ganhos foram: *curl-up* 9.3vs15.2%; *push-up* 11.1vs33.3%; lançamento da BM 6.8vs17.9%; impulsão horizontal -3.3vs29.2%; sêxtuplo -1.5vs5,1% 30m -1.7vs3,9% em todos os testes entre os dois momentos de avaliação, respetivamente no grupo de controlo e experimental. A análise dos resultados mostrou que tanto experimental como o de controlo evidenciaram melhorias entre os dois momentos de avaliação. O experimental apresentou ganhos significativos em todos os testes, o de controlo obteve incrementos, significativos, nos *curl-up* e *push-up*. Quando comparamos as médias dos dois grupos, nos diferentes testes, o grupo experimental apresentou ganhos significativos em todos os testes. No entanto só existiram 2 testes (impulsão horizontal e 30m) onde não se verificaram diferenças de ganhos, estatisticamente significativas, do grupo experimental em relação ao de controlo. A análise comparativa, nos diferentes testes, dos ganhos obtidos pelos rapazes (n=28) e pelas raparigas (n=40), evidenciou que ambos apresentaram ganhos de idêntica expressão, sendo significativos, apenas, no *lançamento BM*, a favor dos rapazes. Quando comparada a média dos dois grupos entre os dois momentos, os rapazes registaram médias, significativamente superiores, às das raparigas.

## Conclusões

Este estudo evidencia que as aulas de EF são suscetíveis de contribuir para a melhoria da força muscular dos alunos, de ambos os sexos. É de salientar que as aulas de EF com um enfoque na organização e aplicação de um programa de treino de força, induzem a ganhos superiores. Podemos, por isso, salientar a importância da implementação do treino da força no contexto escolar, nas aulas de Educação Física.

## Referências

Behm *et al.* (2008). Canadian Society for Exercise Physiology position paper: resistance training in children and adolescents. *J Appl Physiol Nutr Metab*, 33, 547-561

Faigenbaum, A & Myer, G (2010). Resistance training among young athletes: safety, efficacy and injury prevention effects. *Brit J SportsMed*, 44, 56-63.

**Keywords:** força muscular; treino; aulas de educação física.

## 62. EFEITO DA APLICAÇÃO DE UM PROGRAMA DE TREINO DE FORÇA NAS AULAS DE EDUCAÇÃO FÍSICA

Carvalho, C.<sup>1,2</sup> Gonçalves, F.<sup>1,2</sup> Vieira, L.<sup>1,2</sup> Carvalho, A.<sup>1,2</sup> Dias, I.<sup>1,2</sup> Silva, A.J.<sup>1,3</sup> Mourão, I.<sup>1,3</sup> Coelho, E.<sup>1,3</sup> Santos, R.<sup>1,2</sup> & Duarte, A. M.<sup>1,2</sup>

<sup>1</sup>Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano (CIDESD)

<sup>2</sup>Instituto Universitário da Maia (ISMAI)

<sup>3</sup>Universidade de Trás-os-Montes e Alto Douro (UTAD)

### Introdução

O aumento do sedentarismo das crianças e adolescentes, associado ao ínfimo tempo de Atividade Física realizado na Escola e ao reduzido treino específico desenvolvido nas aulas de Educação Física, vai-se repercutir, negativamente, na condição física e na saúde física e psicológica dos alunos (Hangen *et al.* 2013). Existem evidências científicas indicando que as crianças e adolescentes podem aumentar a sua força muscular quando submetidos a programas de treino de intensidade, volume e duração suficientes (Faigenbaum, 2013). Este estudo tem por objetivo investigar o efeito de um programa de treino realizado nas aulas de EF, considerando o sexo e a prática desportiva extracurricular dos alunos.

### Método

Participaram neste estudo 123 alunos do 12º ano da Escola Rocha Peixoto, divididos em dois grupos: um de controlo (n=31) e um experimental (n= 92). A avaliação foi realizada com os testes *push-up* 60", *curl-up* 30", lançamento da BM de 2kg, *sêxtuplo*, impulsão horizontal e 30 metros de *sprint*. O programa de treino era constituído por elevação de gémeos, afundos, semi-agachamento, supino, *butterfly*, remo vertical, *burpees*, balanços com *kettlebell*, abdominais e lombares (2 séries de 15 repetições a ca. 60% 1 RM durante 30" e 60" descanso). O programa de treino teve a duração de 9 semanas com 2 vezes por semana. Para o tratamento dos dados utilizamos medidas descritivas e comparativas.

### Resultados

A análise dos resultados mostrou que, tanto os alunos do grupo experimental como os do grupo de controlo, evidenciaram diferenças entre si nos dois momentos, em todos os testes, embora as diferenças não evidenciassem significância estatística. Ao compararmos as médias dos ganhos nos dois grupos observamos a existência de diferenças significativas nos testes *push-up*, lançamento da BM e *sêxtuplo*, beneficiando o grupo experimental. Os resultados do *t* teste para medidas independentes evidenciaram valores superiores para os alunos do sexo masculino, em todos os testes, e os ganhos, apenas, nos *curl-up*. Os alunos praticantes apresentaram valores significativamente superiores, em todos os testes. Os ganhos observados, embora favorecendo os praticantes, não evidenciaram significância estatística.

### Conclusões

Este estudo evidencia que as aulas de Educação Física podem contribuir para a melhoria da força muscular dos alunos, de ambos os sexos, quer sejam praticantes ou não. Essa melhoria promove uma apreciação mais positiva da sua parte física, afetando a perceção que os alunos fazem do seu Eu, logo, no seu autoconceito e autoestima. É de salientar que as aulas de EF, com um enfoque na organização e aplicação de um programa de treino de força, induzem a ganhos superiores. Podemos, por isso, salientar a importância da implementação do treino da força no contexto escolar, nas aulas de Educação Física.

### Referências

Faigenbaum, A.D. (2013). Resistance Training for Children and Adolescents: Are There Health Outcomes?. *American Journal of Lifestyle Medicine. State of the Art Reviews* 190-200.

Hangen, T., Ommundsen, Y & Seiler, S. (2013). The relationship Between Physical Activity and Self-Esteem in Adolescents: The Role of Physical Fitness Indices. *Pediatric Exercise Science*, 25, 138-153.

**Keywords:** educação física; treino da força; prática desportiva.

## 63. MAXIMAL OXYGEN UPTAKE IN PROFESSIONAL FOOTBALL PLAYERS: COMPARISON BETWEEN LEVELS AND PLAYING POSITIONS

Abade E<sup>1,2</sup>, Teixeira N<sup>2</sup>, Mourão P<sup>2</sup>, Sá P<sup>2</sup> and Carvalho A<sup>1,2</sup>

<sup>1</sup> Creative Lab - Research Center in Sports Sciences, Health and Human Development

<sup>2</sup> Laboratório do Movimento Humano - Maia High Institute (ISMAI)

### Introduction

Elite football is considered a high-intensity intermittent activity that includes short-duration actions that vary according to the specific playing positions with an average oxygen uptake ( $\text{VO}_2\text{max}$ ) around 70% to 75% of maximum oxygen uptake (Bangsbo, Mohr, & Krstrup, 2006). This study aimed to compare the  $\text{VO}_2\text{max}$  values between players from elite and secondary Portuguese divisions in different playing positions.

### Methods

Thirteen-nine Portuguese professional football players participated in the study, 23 from the 1<sup>st</sup> national division (G1: age  $25.9 \pm 3.5$ , height  $179.7 \pm 6.6$  cm, weight  $76.0 \pm 7.1$ ) and 16 from the 2<sup>nd</sup> national division (G2: age  $25.0 \pm 3.3$  years, height  $180.6 \pm 6.1$  cm, weight  $76.6 \pm 9.4$  Kg). The players were grouped as defenders (DEF:  $n=11$ , age  $28.2 \pm 2.1$  years, height  $179.2 \pm 7.1$  cm, weight  $76.2 \pm 10.1$  Kg), midfielders (MID:  $n=14$ , age  $23.8 \pm 1.9$  years, height  $179.8 \pm 6.4$  cm, weight  $75.4 \pm 5.8$  Kg) and forwards (FW:  $n=14$ , age  $24.0 \pm 4.2$  years, height  $179.3 \pm 6.3$  cm, weight  $75.6 \pm 7.9$  Kg). For  $\text{VO}_2\text{max}$  determination, players performed an incremental continuous treadmill exercise until fatigue occurred.  $\text{VO}_2\text{max}$  was measured with Fitmate MED portable spirometer v 2.2 (COSMED). The Cohen's  $d_{\text{unb}}$  effect sizes with 95% of confidence Intervals (95% CI) were calculated using pooled standard deviation for the comparisons and the magnitude thresholds for mean differences were: 0-0.2, trivial; >0.2-0.6, small; >0.6-1.2, moderate; >1.2-2.0, large; and >2.0, very large.

### Results

The G1 results ( $57.56 \text{ ml.kg.min}^{-1}$ ) differed 3,4% from G2 values ( $59.34 \text{ ml.kg.min}^{-1}$ ) which represents a small effect (Cohen's  $d_{\text{unb}}$  [95%], 0.33 [-0.31, 0.98]). The average  $\text{VO}_2\text{max}$  value for the DEF was  $57.6 \text{ ml.kg.min}^{-1}$ , less 5.4% than MID ( $60.9 \text{ ml.kg.min}^{-1}$ ) which represents a moderate effect (0.69 [-0.12, 1.54]). Small differences were found between DEF and FW and between MID and FW.

### Conclusion

Previous investigations in elite football with similar methodologies found average  $\text{VO}_2\text{max}$  values of  $62.5 \text{ ml.kg.min}^{-1}$  (Arnason et al., 2004). Iceland first league. Other studies obtained average values ( $\text{ml.kg.min}^{-1}$ ) of 63.7 (Wisloff, Helgerud, & Hoff, 1998) and 60.9 (Bangsbo, 1994) in Norwegian and Danish first leagues, respectively. Our results show that  $\text{VO}_2\text{max}$  values in Portuguese first league are inferior to those observed in the abovementioned studies. We have also verified few differences between playing positions. However, the higher values found in MID may be the result of their specific tactical role in the game, characterized by higher distances covered than DEF or FW (Gonçalves, Figueira, Maçãs, & Sampaio, 2013).

### References

- Arnason, A., Sigurdsson, S. B., Gudmundsson, A., Holme, I., Engebretsen, L., & Bahr, R. (2004) Physical fitness, injuries, and team performance in soccer. *Med Sci Sports Exerc*, 36(2), 278-285. doi: 10.1249/01.MSS.0000113478.92945.CA
- Bangsbo, J. (1994) The physiology of soccer--with special reference to intense intermittent exercise. *Acta Physiol Scand Suppl*, 619, 1-155.
- Bangsbo, J., Mohr, M., & Krstrup, P. (2006) Physical and metabolic demands of training and match-play in the elite football player. *J Sports Sci*, 24(7), 665-674. doi: 10.1080/02640410500482529
- Gonçalves, B. V., Figueira, B. E., Maçãs, V., & Sampaio, J. (2013) Effect of player position on movement behaviour, physical and physiological performances during an 11-a-side football game. *Journal of Sports Sciences*, 1-9. doi: 10.1080/02640414.2013.816761
- Wisloff, U., Helgerud, J., & Hoff, J. (1998) Strength and endurance of elite soccer players. *Med Sci Sports Exerc*, 30(3), 462-467.

**Keywords:** football, aerobic performance, physical fitness.

# 65. COMPARISON OF THE HAMSTRING/QUADRICEPS RATIOS FOR THE ASSESSMENT OF MUSCLE BALANCE IN FOOTBALL PLAYERS OF FIRST AND SECOND PORTUGUESE LEAGUES

Carvalho, A.<sup>1,2</sup> Mourão, P.<sup>2</sup> Carvalho, C.<sup>2</sup>, Resende, R.<sup>3</sup> and Abade, E.<sup>1,2</sup>

<sup>1</sup>Research Center in Sports Science, Health and Human Development (CIDESD, CreativeLab)

<sup>2</sup>Human Movement Laboratory; Higher Education Institute of Maia; Portugal

<sup>3</sup>Higher Education Institute of Maia; Portugal

## Introduction

The imbalance in the hamstring to quadriceps (H:Q) ratio increases the susceptibility to hamstring strains and anterior cruciate ligament (ACL) injuries in soccer (Holcomb et al. 2007). A hamstrings/quadriceps (H/Q) strength ratio based on concentric peak torque values has traditionally been used to describe the potential for knee-joint destabilization. However, the strength relationship between knee extension and flexion may be better described by functional ratios of eccentric hamstrings and concentric quadriceps peak torque. The purpose was to compare the muscle strength imbalances between professional soccer players of different performance levels (first and second league).

## Methods

The study involved 159 senior male soccer players divided in two study groups: (A) group of 75 players from first league and (B) group of 84 players from second league. The isokinetic evaluation consisted of 5 concentric contractions at 60°s<sup>-1</sup>. Two minutes later, 5 eccentric contractions were performed at 60°s<sup>-1</sup> to the right lower limb. The same procedure was applied to the left lower limb. All tests were performed using a REV9000 (Technogym, Italy) isokinetic dynamometer. Maximal peak torque data were used to calculate quadriceps and hamstring strength, the conventional and functional H:Q ratios and bilateral differences. The data were analyzed using an independent t-test.

## Results

First league players presented higher values ( $p < 0.05$ ) of concentric and eccentric strength in quadriceps and hamstrings. Only in left quadriceps eccentric strength no statistical significance was found. In the conventional H:Q ratios, the first league players presented higher values. On the other hand, we found higher values of functional H:Q ratios in second league players in both legs. The first league players presented higher values of bilateral differences in quadriceps and lower values in hamstrings.

## Conclusion

An important finding of the present study was that both, first and second league players, were near the commonly recommended 0.6 conventional H:Q ratio. However, when we analyzed functional H:Q ratio, we verified that both players were far from the reference (1.0), with mean values of 0.7. A recent prospective investigation determined through isokinetic testing that a strength imbalance ( $\geq 20\%$  bilateral deficit) between the eccentric hamstrings (30°/s) and concentric quadriceps (240°/s) ratio resulted in a 4-fold increase in risk of hamstring injury compared to a normal strength profile (Croisier et al. 2008). Curiously, the difference that we found was even higher ( $\pm 30\%$ ). The identification of risk factors related to the hamstring injury represents a key pillar for the development of appropriate preventive measures. Coaches should consider this information when planning their training programs and must promote exercises, mainly focused on the hamstrings (eccentric), to prevent muscular injuries.

## References

Holcomb, W.R., Rubley, M.D., Lee, H.J., and Guadagnoli, M.A. Effect of hamstring-emphasized resistance training on hamstring:quadriceps strength ratios. *J. Strength. Cond. Res.* 21: 41-47, 2007.  
Croisier JL, Ganteaume S, Binet J, Genty M, Ferret JM. Strength imbalances and prevention of hamstring injury in professional soccer players: a prospective study. *Am J Sports Med.* 2008; 36:1469–1475.

**Keywords:** football, strength imbalances, functional ratio.

## 68. FOOTBALL ANALYSIS OF THE INTERNATIONAL MILAN LONG TERM ATTACK THAT END SUCCESSFULLY

António Barbosa<sup>1</sup>, Hugo Sarmento<sup>2</sup>, José Neto<sup>3</sup> and Jorge Campaniço<sup>4</sup>

<sup>1</sup> Polytechnic Institute of Guarda, Portugal

<sup>2</sup> University Institute of Maia; Polytechnic Institute of Viseu, Portugal

<sup>3</sup> University Institute of Maia, Portugal

<sup>4</sup> University of Trás-os-Montes e Alto Douro, Portugal

### Introduction

Explosive concentric strength and muscle power are important to successful performance in football. In fact, high relationships were found between team average jump height and team success. Vertical jump performance involving both legs is a closed chain movement with different muscle activation patterns and a knee angular velocity not limited which allows a transfer of energy between joints. Isokinetic assessment is generally performed during single joint open kinetic chain movements (e.g. knee extension) and it is limited to an angular velocity. These characteristics make the isokinetic evaluation relatively nonspecific, mainly for sports where stretch-shortening cycles are frequently performed. The main objective of this study was to describe and compare the power and explosive strength among three groups of men's football Portuguese teams of different competition levels.

### Methods

The study involved 120 senior male Portuguese players divided into two groups: A) group of athletes who played in the first national division; and (B) group of athletes who played in the second national division. Note that all athletes performed three attempts for Squat Jumps (SJ), Countermovement Jumps (CMJ), Abalakov Jump (ABK), Right Leg Jump (RLJ) and Left Leg Jump (LLJ) with the best one being selected. All jumps were performed on a force platform (AMTI model Bp-4100) at a sampling rate of 2000 Hz. Isokinetic assessment was performed with subjects sitting with the thigh at an angle of 85° to the trunk. During the session, the evaluation began with 5 concentric contractions at 90°s<sup>-1</sup> to the right lower limb. All tests were performed using a REV9000 (Technogym, Italy) isokinetic dynamometer.

### Results

Table 1 shows that regarding to the SJ and ABK, no differences were found. However, in the other vertical jumps, the group A had a greater average height performance (more 34 cm in CMJ; more 35 cm in RLJ; and more 26 cm in LLJ). These results are according to literature, which state that elite players exhibit better performances in vertical jumps tests. The table 2 and 3 illustrates that group A had the higher peak torque values in right quadriceps and hamstrings muscles concentric actions and in the left hamstrings concentric actions. The other variables did not show any statistical significant differences.

### Conclusion

This study demonstrated that the power and explosive strength, assessed with vertical jumps are very important for football players' specific performance. Additionally, it was possible to see that the best performance group (A) can generate, on average, a higher force, getting more speed and power output during countermovement jump and unilateral jumps, and better peak torque in concentric actions of right quadriceps muscles and in concentric actions of right and left hamstring muscles. We concluded that explosive strength and power are very important in football performance.

**Keywords:** football; power; explosive strength.



## 70. POST-ACTIVATION POTENTIATION AFTER A CONDITIONAL CONTRACTION

Ribeiro, T. <sup>(1)</sup>, Jiménez-Reyes, P. <sup>(2)</sup>, Lopes, H. <sup>(3)</sup>, Vila-Chã, C. <sup>(4)</sup>, Roca, J. <sup>(5)</sup> Conceição, F. <sup>(6)</sup>,

<sup>1</sup>Faculdade de Desporto, Universidade do Porto, Porto, Portugal

<sup>2</sup> Faculty of Physical Sciences and Sport, Catholic University of San Antonio, Murcia, Spain

<sup>3</sup> DEM, ISEP, Instituto Politécnico do Porto, Portugal

<sup>4</sup> Escola Superior de Educação de Bragança, Bragança, Portugal

<sup>5</sup> Faculty of Physical Sciences and Sport, Catholic University of San Antonio, Murcia, Spain

<sup>6</sup> Faculdade de Desporto, Universidade do Porto, Porto, Portugal

### Introduction

The post-activation potentiation (PAP) is defined to be an increase of the muscle contraction force after the execution of a conditional contraction (CC) maximal or submaximal (Robbins, 2005). Physiological and neural mechanisms responsible for the expression of PAP are the increase of phosphorylation of myosin regulatory light chain (Hodgson et al., 2005; Sale, 2002), the increase in the recruitment of higher order motor units (Chiu et al., 2003; Güllich & Schmidtbleicher, 1996; Hamada et al., 2000; Scott & Docherty, 2004) and the change in pennation angle (Tillin & Bishop, 2009). However, the athletes' individual characteristics and CC's characteristics also influence the extent of PAP.

### Methods

This study aims to understand the impact of two types of stimuli protocol, in the PAP parameters obtained through the CMJ after a CC (squat) with 23 athletes (7 female and 16 male). For this purpose a non-parametric MANOVA was used in order to identify the moment when the window of opportunity of PAP occurs at 0, 4, 8 and 12 minutes after the completion of different CC's. The protocols consisted in: i) protocol 1 - 3 sets of 3 reps of squats with 4 minutes of rest; ii) protocol 2 3 series of 6 to 8 repetitions of squats with 5 minutes rest; and iii) control protocol that has involved 20 minutes of rest.

### Results

The results indicate that there are no statistically significant differences in the variables analyzed: CMJ height, power peak, stiffness, maximum RFD and force peak. However, in general, there is an average trend to the decrease of values after CC, and, at the same time, an increase over the pre-established intervals, sometimes exceeding baseline.

### Conclusion

Thus, despite the trend seems to point to the time intervals described in the literature, it was not possible to identify the time of when PAP occurred, which could be associated to the reduced sample size. Therefore, we can conclude that the effects of PAP in the athlete's performance after carried out two different sort of warm-up of are still very inconsistent and that there are needed further studies, with a higher sample size in order to assess its effects more accurately.

### References

- Chiu, L., Fry, A., Weiss, L., Schilling, B., Brown, L., & Smith, S. (2003). Postactivation Potentiation Response in Athletic and Recreationally Trained Individuals. *Journal of Strength and Conditioning Research*, *17*(4), 671.
- Güllich, A., & Schmidtbleicher, D. (1996). MVC-induced short-term potentiation of explosive force. *New Studies in Athletics*, *11*(4), 67-81.
- Hamada, T., Sale, D., MacDougall, D., & Tarnopolsky, M. (2000). Postactivation potentiation, fiber type, and twitch contraction time in human knee extensor muscles. *Journal of Applied Physiology*, *88*(6), 2131-2137.
- Hodgson, M., Docherty, D., & Robbins, D. (2005). Post-Activation Potentiation - Underlying Physiology and Implications for Motor Performance. *Sports Medicine*, *35*(7), 585-595.
- Robbins, D. (2005). Postactivation Potentiation and Its Practical Applicability: A Brief Review. *Journal of Strength and Conditioning Research*, *19*(2), 453-458.
- Sale, D. (2002). Postactivation Potentiation: Role in Human Performance. *Exercise and Sport Sciences Reviews*, *30*(3), 138-143.
- Scott, S., & Docherty, D. (2004). Acute Effects of Heavy Preloading on Vertical and Horizontal Jump Performance. *Journal of Strength and Conditioning Research*, *18*(2), 201-205.
- Tillin, N. A., & Bishop, D. (2009). Factors Modulating Post-Activation Potentiation and its Effect on Performance of Subsequent Explosive Activities. *Sports Medicine*, *39*(2), 147-166.

**Keywords:** post-activation potentiation, explosive power, conditioning contraction, squat, cmj.

## 72. SPORT TRAJECTORIES AND INVOLVEMENT OF PORTUGUESE OLYMPIC RISING STARS

Marcio Domingues<sup>1</sup>

<sup>1</sup> CPES, Lisbon, Portugal

### Introduction

Youth involvement in sport has been related to a wide scale of indices of positive development (Rose-Krasnor, 2009). Thus, sport gained a new dimension in modern society due to social concerns about health, economy, pro-social values, and personal and community development. Recent research (Martin, McCaughy, Murphy & Kimberlydawn, 2011) brought evidences that different ecologies of practice produce different personal outcomes for the athletes who engage in competitive settings for long periods of time. Hence, the study of ecological contexts is especially relevant in order to clarify the effects of sport engagement and to highlight the factors that can optimize the positive influences associated with sport participation.

### Methods

The aim of this study is to explore under 18 Portuguese Olympic athletes from two perspectives. First, analyzing the athlete's personal dispositions, researchers will try to determine their attitudes, beliefs and engagement in their Olympic project; secondly, how sport trajectories and involvement come together with the ideal values of olympism. The research will try to address the process of exploring pedagogical strategies, through retrospective interviews, that are necessary to or seem to facilitate the development of and the reinforcement of positive values and behaviors.

### Conclusions

This project addresses issues and concerns with respect to the teaching of four core educational values as being closely related to the concept of Olympism: joy of endeavour in sport, fair play (sportsmanship), social acceptance and being the best that you can be in a goal setting sport context (pursuit of excellence). Therefore, one of the study's aims is to assess how athletes perceive their sport participation when compared to elite Olympic athletes, i.e. from a developmental perspective, how their prolonged engagement focusing on psychosocial factors converge to the Olympic ideals.

### References

- Martin, J., McCaughy, N., Murphy, A., & Kimberlydawn, W. (2011). Using social cognitive theory to predict physical activity and fitness in underserved middle school children. *Research Quarterly for Exercise Sport*, 82(2), 27-256.
- Rose-Krasnor, L. (2009). Future Directions in Youth Involvement Research. *Social Development*, 18 (2), 497-509.

**Keywords:** Olympic; Young Athletes; Ecology; attitudes.

# 75. EFECTOS DEL ENTRENAMIENTO INTERVÁLICO DE ALTA INTENSIDAD SOBRE ACCIONES EXPLOSIVAS EN JÓVENES JUGADORES DE BALONMANO

Camacho-Cardenosa, M, Camacho-Cardenosa, A, Martínez, I, Muñoz, D, Timon, R, Brazo-Sayavera, J.

*Facultad de Ciencias del Deporte, Universidad de Extremadura, Cáceres, España*

## Introducción

Una desventaja importante del entrenamiento continuo tradicional en los deportes de equipo dentro de la parte física, además del requisito de tiempo, es que carece de especificidad para mejorar otros componentes de la condición física, como pueden ser la fuerza o la velocidad. Por tanto el objetivo del estudio fue analizar qué efectos tiene un programa de entrenamiento interválico de alta intensidad (HIIT) sobre la velocidad y la fuerza explosiva del tren inferior de jugadores de balonmano adolescentes como alternativa al entrenamiento tradicional.

## Método

Durante 10 semanas, y tras las sesiones de entrenamiento técnico-tácticas diseñadas por el entrenador, un grupo de jugadores de balonmano ( $n = 7$ ;  $14,75 \pm 0,96$  años) fueron sometidos a un programa de HIIT, consistente en sprints, y que evolucionó en cuanto al número de series (de 4 a 6) como a la relación esfuerzos:recuperaciones (1:3 – 1:1). El otro grupo de jugadores ( $n=7$ ;  $15,33 \pm 1,53$  años) realizó un trabajo continuo de baja intensidad (LIT) de la misma duración que el otro grupo. Se evaluaron antes y después de la intervención la velocidad, por medio del test de carrera de 20 m. con salida de pie, desde parado, y la fuerza explosiva del tren inferior por medio de tres test de salto (SJ, CMJ, CMJFa), realizado sobre dos barras ópticas (OptojumpNext, Microgate, Bolzano, Italia). Mediante una prueba ANOVA de medidas repetidas se establecieron las diferencias intra e inter sujetos y la  $d$  de Cohen para determinar el tamaño del efecto.

## Resultados

Se encontraron diferencias estadísticamente significativas intrasujeto en la velocidad medida en el grupo HIIT ( $p=0,050$ ;  $TE=0,54$ ), así como en la altura del Squat Jump ( $p=0,025$ ;  $TE=0,17$ ). Estas diferencias no se observaron en los parámetros del grupo LIT. No se encontraron diferencias estadísticamente significativas entre grupos en la línea base y tras las 20 sesiones de entrenamiento en ninguna de las variables inter sujetos.

## Conclusiones

El entrenamiento interválico de alta intensidad como complemento del entrenamiento técnico-táctico mejoró la velocidad de desplazamiento sobre 20 metros y el rendimiento en Squat Jump de manera estadísticamente significativa en jóvenes jugadores de balonmano. No se encontraron mejoras estadísticamente significativas en jugadores sometidos a un programa de entrenamiento de baja intensidad como complemento al entrenamiento específico de balonmano.

## Referencias

Cherif, M., Said, M., Chaatani, S., Nejlaoui, O., Gomri, D., & Abdallah, A. (2012). The effect of a combined high-intensity plyometric and speed training program on the running and jumping ability of male handball players. *Asian J Sports Med*, 3(1), 21-28.  
Cregg, C. J. (2013). Effects of high intensity interval training and high volume endurance training on maximal aerobic capacity, speed and power in club level gaelic football players (Vol. 1): Dublin City University.

**Keywords:** interval training; handball; adolescent.

## 76. SPATIO-TEMPORAL COORDINATION IN FRONT CRAWL AT DIFFERENT INTENSITIES - A CASE STUDY

Silva, A.F.<sup>1,2</sup>, Morais, S.T.<sup>2</sup>, Sousa, M.<sup>1</sup>, Sardinha, M.<sup>1</sup>, Fernandes, R.J.<sup>1,2</sup>, Figueiredo, P.<sup>1,3</sup>

<sup>1</sup> CIFI<sup>2</sup>D, Faculty of Sport, University of Porto, Porto, Portugal

<sup>2</sup> LABIOME<sup>2</sup>P, University of Porto, Porto, Portugal

<sup>3</sup> School of Physical Education, UFRGS, Porto Alegre, Brazil

### Introduction

The study of coordination is related to the analysis of the different kinds and degrees of functional order among interacting parts and processes in time and space (Kelso, 1995). Continuous Relative Phase (CRP) allows the assessment of both spatial and temporal evolution of coordination, providing information about the amount of coupling between pairs of joints (Figueiredo, Seifert, Vilas-Boas, & Fernandes, 2012). This kind of approach has been scarce in swimming analysis, and never used in age-group swimmers. This study aimed to analyze coordination in maximal, sub-maximal and low intensity, as well as stroke frequency (SF) and stroke length (SL), in 50m front crawl.

### Methods

One female swimmer (15yrs, 1.70m, 60.2kg) performed three repetitions of 50m: (i) at maximal (100%); sub-maximal (90%); and (iii) low velocity (70%). A visual pacer (Pacer2Swim, KulzerTEC, Portugal) was used to control the velocity. One swimming cycle were analyzed using ten anatomical landmarks identified with reflective markers and tracked using a 13-camera Qualisys system (Qualisys AB, Gothenburg, Sweden). CRP was calculated through the difference between the normalized phase angles of two segments motions and the relative time spent in in-phase (when homologous muscles were activated at the same time) and anti-phase (simultaneous activation of non-homologous muscles) was calculated. Also, relative duration of the propulsive (pull and push phases) and non-propulsive (entry and catch and recovery) phases was computed for both right ( $R_{prop}$  and  $R_{non-prop}$ ) and left ( $L_{prop}$  and  $L_{non-prop}$ ) arms. SL was determined by the horizontal distance traveled by the hip during a complete cycle, and SF as the inverse of the time needed to complete a swimming cycle.

### Results

In Table 1 it is observed that SF diminished with velocity decreased. SL increased in the 90%, however in the lowest velocity diminished. A trend to increase propulsive and decrease non-propulsive phases with increasing velocity was identified. Time in anti-phase increased with increasing velocity.

**Table 1:** General biomechanical parameters, propulsive and non-propulsive percentages of the stroke cycle for both arms and phase and anti-phase percentages for three different swimming intensities.

velocity (%)	velocity ( $m \cdot s^{-1}$ )	SF (Hz)	SL (m)	$R_{prop}$ (%)	$L_{prop}$ (%)	$R_{non-prop}$ (%)	$L_{non-prop}$ (%)	In-phase (%)	Anti-phase (%)
100	1.35	0.68	1.99	39.3	36.6	60.7	63.5	58.2	41.8
90	1.21	0.54	2.02	31.0	45.4	69.0	54.6	64.9	35.1
70	1.01	0.36	1.74	31.9	33.3	68.1	67.0	81.0	19.0

### Conclusion

The swimmer increased SF, reducing SL in response to the velocity increase. However, to adapt to the lowest velocity, the swimmer had also to decrease SL. A progressive increase in the propulsive phases was expected with velocity increase, but the swimmer had difficulties to adapt, evidencing an asymmetry between arms in the sub-maximal effort, probably due to her low experience. Nevertheless, the increase in the relative duration in anti-phase, with the increase in velocity, evidenced an adaption to the task constraints resulting in a greater coupling and a coordination pattern closer to the intrinsic anti-phase mode.

**Acknowledgements:** FCT grant: DFRH - SFRH/BD/87780/2012.

### References

Figueiredo, P., Seifert, L., Vilas-Boas, J. P., & Fernandes, R. J. (2012). Individual profiles of spatio-temporal coordination in high intensity swimming. *Human Movement Science*, 31(5), 1200-1212. || Kelso, J. A. S. (1995). *Dynamic patterns: The self-organization of brain and behavior*. Cambridge, Mass: MIT Press.

**Keywords:** Coordination; motor control; young swimmer; biomechanics.

## 77. ENERGY SYSTEM CONTRIBUTION DURING 100 M FRONT CRAWL SWIMMING

João Ribeiro<sup>1</sup>, Ana Sousa<sup>1</sup>, Pedro Figueiredo<sup>1,2</sup>, Phornpot Chainok<sup>1</sup>, Ana Silva<sup>1</sup>, Valdir Junior<sup>1</sup>, João Paulo Vilas-Boas<sup>1,3</sup>, Ricardo J Fernandes<sup>1,3</sup>

<sup>1</sup> CIFI<sup>2</sup>D, Faculty of Sport, University of Porto, Porto, Portugal

<sup>2</sup>School of Physical Education, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

<sup>3</sup>LABIOME<sup>3</sup>, University of Porto, Porto, Portugal

### Introduction

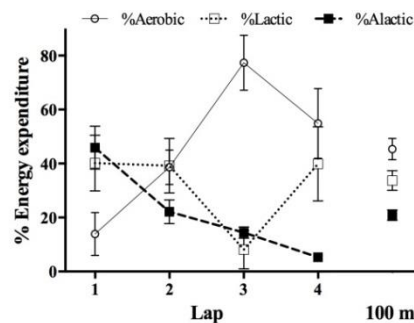
Competitive swimming events are performed in different time durations and intensities. Hence, each event requires a specific energetic demand that can be described in terms of relative contribution of aerobic and anaerobic energy sources to overall energy expenditure (E) (Capelli, Pendergast, & Termin, 1998). Our purpose was to determine the relative contribution of the aerobic (Aer), anaerobic lactic (AnL) and anaerobic alactic (AnAl) energy sources during each of the four laps of a 100 m front crawl maximal effort, as well as in the whole event.

### Methods

Eight trained swimmers (18.26±1.38yrs, 1.79±0.02m, 73±2.49kg) performed a 100 m maximal front crawl swim, as well as 25, 50, and 75 m at the respective pace attained in the 100 m. Oxygen uptake was measured by a portable gas analyser (K4b<sup>2</sup>) connected to the Aquatrainer snorkel (Cosmed, Rome, Italy) and capillary blood lactate was collected at rest and during the recovery period of each swim (Lactate Pro, Arkray, Inc., Japan). E was computed as the sum of Aer, AnL and AnAl components (Figueiredo, Zamparo, Sousa, Vilas-Boas, & Fernandes, 2011).

### Results

The relative contribution of Aer, AnL and AnAl to total E in each 25 m lap of the 100 m and in the whole event are presented in Figure 1.



**Figure 1:** Relative contribution of aerobic, anaerobic lactic and anaerobic alactic energy sources to total energy expenditure in each 25 m laps of the 100 m and in whole 100 m front crawl event.

### Conclusions

During the 100 m front crawl event the Aer contribution reveals to be essential in the last stages of the effort, highlighting its importance even in short and very intense events. Nonetheless, the AnL contribution is indispensable during the full event with the exception of the third partial (mainly supported by the aerobic energy pathway). AnAl contribution assumes its preponderance in the first stage of the effort. These data points out that appropriate training stimulus should address the three energy sources contributions in the different phases of 100 m front crawl, enabling an appropriate competition strategy.

**Acknowledgement:** PTDC/DES/101224/2008 and SFRH/BD/81337/2011.

### References

- Capelli, C., Pendergast, D. R., & Termin, B. (1998). Energetics of swimming at maximal speeds in humans. *European Journal of Applied Physiology*, 78(5), 385-393.
- Figueiredo, P., Zamparo, P., Sousa, A., Vilas-Boas, J. P., & Fernandes, R. J. (2011). An energy balance of the 200 m front crawl race. *European Journal of Applied Physiology*, 111(5), 767-777.

**Keywords:** Bioenergetics; Energy Contribution; 100 m; front crawl; Swimming.

# 78. CARACTERIZAÇÃO DO DÉFICIT DE OXIGÉNIO NO DOMÍNIO DA INTENSIDADE SEVERA NO NADO CRAWL-AMARRADO

Espada, M.C.<sup>1,2</sup>, Siqueira, L.O.<sup>3</sup>, Simionato, A.R.<sup>3</sup>, Pestana, D.<sup>4</sup>, Barreto, A.N.<sup>4</sup>, Bombonatti, J.L.<sup>4</sup>, Imaizum, L.F.<sup>4</sup>, Silva, W.R.<sup>4</sup>, Ishizava, L.Y.<sup>4</sup>, Pereira, A.<sup>2,5</sup>, Pessôa-Filho, D.M.<sup>4</sup>

<sup>1</sup>CIPER - FMH, Lisboa, Portugal

<sup>2</sup>Instituto Politécnico Setúbal, Portugal

<sup>3</sup>Instituto de Biociências, PPG-DEHUTE - Unesp, Rio Claro, Brasil

<sup>4</sup>Faculdade de Ciências, Educação Física - Unesp, Bauru, Brasil

<sup>5</sup>CIDESD - UTAD, Vila Real, Portugal

## Introdução

A magnitude do déficite de oxigénio (DefO<sub>2</sub>) na transição entre repouso-exercício têm influenciado a tolerância ao esforço por estar relacionado com a participação anaeróbia durante o ajuste primário do consumo de oxigénio (VO<sub>2</sub>) ao exercício. Na natação, a grande quantidade de eventos competitivos entre 100 a 1000 segundos (exemplo: 200 a 1500 metros) dependem da velocidade de ajuste do metabolismo oxidativo e da tolerância ao esforço, tornando imprescindível a quantificação do DefO<sub>2</sub> para análise da efetividade da resposta oxidativa do nadador. O objectivo deste estudo centrou-se em analisar a magnitude do DefO<sub>2</sub> no domínio da intensidade severa de nado-amarrado.

## Métodos

Foram avaliados 16 nadadores (11 homens: 18.0±4.0 anos, 180.2±6.8 cm, 71.8±9.5 kg e 5 mulheres: 16.8±3.6 anos, 166.2±5.5 cm, 61.1±9.8 kg), submetidos a um teste progressivo em sistema convencional de cargas amarradas ao nadador, com incrementos de 5% por minuto [variando entre 30-100% da força média amarrada - F<sub>medAmarrada</sub>, determinada em célula de carga (Morouço *et al.*, 2011)]. O VO<sub>2</sub> foi avaliado por um sistema automático e portátil (K4b<sup>2</sup> Cosmed) de análise direta de trocas gasosas pulmonares, acoplado ao nadador por um snorkel com válvula tridimensional (Aquatrainer®). Determinou-se o consumo máximo de oxigénio (VO<sub>2max</sub>) e carga correspondente ao VO<sub>2max</sub> (iVO<sub>2max</sub>), como o maior valor médio (9s) de VO<sub>2</sub> e a carga onde ocorreu, respetivamente. A cinética do VO<sub>2</sub> foi analisada através de um ajuste mono-exponencial, com tempo de atraso da resposta inicial (TD), sobre a média das respostas do VO<sub>2</sub> em duas transições repouso-exercício no domínio da intensidade severa. O valor de DefO<sub>2</sub> foi quantificado pelo tempo médio da resposta inicial [TMR = TD + τ (constante da resposta)], multiplicado pela amplitude da cinética primária do VO<sub>2</sub> (ΔVO<sub>2</sub> = A<sub>1</sub>) (Whipp *et al.*, 2005).

## Resultados

As referências de aptidão aeróbia máxima de homens e mulheres, foram, respetivamente: VO<sub>2max</sub>=3732.7±364.8 ml.min<sup>-1</sup> e 2747.3±184.9 ml.min<sup>-1</sup>, iVO<sub>2max</sub>=94.0±14.1 N vs. 74.4±8.0 N. A partir dos parâmetros de amplitude do VO<sub>2</sub> acima dos valores basais (A<sub>1</sub>=2835.3±317.3 ml.min<sup>-1</sup> e 1938.6±80.9 ml.min<sup>-1</sup>) e temporais (TMR=40.9±11.4 s e 39.4±6.1 s), obteve-se o DefO<sub>2</sub> (1933.4±574.3 ml.min<sup>-1</sup> e 1269.7±150.9 ml.min<sup>-1</sup>).

## Conclusões

O valor de DefO<sub>2</sub> parece ter sido influenciado pela amplitude alvo da resposta primária do VO<sub>2</sub> e não pela resposta temporal oxidativa no músculo, que por sua vez é similar aos valores evidenciados por nadadores em nado livre (Reis *et al.*, 2012), facto que evidencia a pertinência de utilização do nado-amarrado no controlo do treino na natação.

**Agradecimentos:** CNPq (479262/2013-6) e Santander Totta (IPS/2014).

## Referências

- Morouço, P., Keskinen, K.L., Vilas-Boas, J.P., Fernandes, R.J. (2011). *J Appl Biomech*; 27 (2): 161-169.  
Whipp, B.J., Ward, S., Rossiter, H.B. (2005). *Med. Sci. Sports Exerc*; 37 (9): 1574-1585.  
Reis, J.F., Alves, F.B., Bruno, P.M., Vleck V., Millet, G.P. (2012). *J Sci Med Sport*; 15: 58-63.

**Keywords:** Nado-amarrado; Cinética do consumo de oxigénio; Déficit de oxigénio; Intensidade severa.

## 80. THE EFFECT OF DIFERENT WARM-UP IN HANDBALL: THERMOGRAPHY ANALYSIS

Sá, G. <sup>1</sup>; Louro, H. <sup>1,2</sup>; Conceição, A. <sup>1,2</sup>

<sup>1</sup> Sport Sciences School of Rio Maior, Rio Maior, Portugal

<sup>2</sup> CIDESD- Research Center in Sports Sciences, Health and Human Development, Vila Real, Portugal

### Introduction

The warm-up is designed to elevate core body temperature and is primarily performed to increase the range of motion at a joint or group of joints (Knudson, 2008). It is well accepted that generalized warm-up movements are important to maximizing sport performance and reduce injury risk (Dumitru, 2010). Therefore, this is essential to understand the effects of different warm-ups on the handball events. The aim of this study was to assess the temperature changes between the muscles deltoid anterior and posterior in response of different warm-ups in handball.

### Methods

21 male handball university players (age: 20.64±1.27 years old; weight: 68.93±7.14 kg; height: 1.72±0.10 m; BMI: 22.89±2.04 Kg.m<sup>2</sup>). The mean skin temperatures were measured by a camera Flir I60 Thermal Imaging Infrared Camera. Emissivity used to collect the data was 0.98. The thermographic images were measured at 2 meters distance to the subjects, and 1.20 m of height of the anterior and posterior part of the body in the muscles anterior deltoid and posterior deltoid. 10 subjects (Group A) performed a thermography measurement: 1) before the warm-up; 2) after the warm-up; 3) after a handball game; and 11 subjects (Group B) performed a thermography measurement: 1) before the warm-up; 2) after 8 minutes of pause and 3) after a handball game.

### Results

The results showed that skin temperature of both muscles decrease after the warm-up and increase slightly after the handball game in both groups (table 1). With the 8' pause for the group B the results in the handball game after the pause increased in the deltoid anterior (33.68°C) and deltoid posterior (33.75°C) comparing after warm-up in the group B.

**Table 1:** Skin temperature for the anterior deltoid and posterior deltoid.

Group	Test Conditions				
	Before warm-up anterior/posterior	After warm-up anterior/posterior	Handball game anterior/posterior	8' Pause anterior/posterior	Handball game anterior/posterior
A	34.38°C / 34.44 °C	32.01°C / 32.55°C	33.56°C / 33.75°C	----	----
B	34.26 °C / 34.82 °C	31.63°C/ 33.71°C	----	x	33.68°C / 33.75°C

### Conclusion

This study showed significant variations of the skin temperatures according to the different conditions of warm-up, suggesting the possibility of use thermographic images to improve the knowledge of the warm-up effects and to determine the anatomic location of the muscle injury.

### References

- Dumitru, D. (2010). The Importance of a specific warm-up on the performance of the handball goalkeeper. *Journal of Physical Education and Sport*, 28, 3.
- Knudson, D.V. (2008). *Warm-up and Flexibility*. In: Chandler TJ, Brown LE. Conditioning for Strength and Human 6. Performance. Philadelphia.

**Keywords:** Thermography; Warm-Up; Handball.

## 90. FLEXIBILITY METHODS EFFECT IN EXPLOSIVE STRENGTH IN GYMNASTICS/TEAMGYM

Barreto, Joana<sup>1</sup>, Peixoto César<sup>1</sup>

<sup>1</sup>Fac. Motricidade Humana, U. de Lisboa, Portugal

### Introduction

The aim of this work is to understand the relation between methods used for develop flexibility and explosive work of lower limbs. The literature reveals that there are controversies about flexibility methods that should be use in explosive sports as gymnastics and in particular TeamGym. Studies indicates that the best flexibility methods are ballistic and dynamic, since there is a prejudicial effect in flight time, maximal voluntary force and technical performance when use static and Proprioceptive Neuromuscular Facilitation (PNF) methods.

### Methods

Twelve male TeamGym senior elite gymnasts (25.75±6.73 years age, 18.58±6.08 years of gymnastics practice), gymnasts participated in TeamGym National Championship (January 2013) from all levels and 414 students who participated in FMH pre-requisites (115 female and 299 male individuals, 66.97±10.09Kg and 172.11±8.28m height), took part in this study.

We observed and recorded the 112 gymnasts training sessions for a complete season (flexibility methods before explosive muscular actions). We observed and register warm-ups exercises in TeamGym national championship before competition. We measured flexibility levels from FMH candidates and compared with fitnessgram values (sit and reach). We used SPSS Statistics 22 program for descriptive analysis test in comparing the nominal variables.

### Results

The team we observe for a season used PNF and dynamic methods in warm-up. In TNC, we noted the use of static method (less than 30 seconds duration) and dynamic method in floor warm-up. The TeamGym team we followed for one season was the only using PNF for floor. The static method with less than 30 seconds was predominant in tumbling and trampet warm-ups for all teams; except for the team we followed that used PNF. When compared to Fitnessgram values for more than 17 years old, girls who participated in FMH pre-requisites had poor values for sit and reach (mean = 24,33cm ± 13,43 std. deviation; reference = 30,5cm), boys had good values (mean = 24,24 ± 13,47 std. deviation; reference = 20,3cm).

### Conclusions

We conclude that flexibility influences gymnastics disciplines that involve explosive muscle contractions as TeamGym. The best methods to develop flexibility before explosive muscle contractions (in warm-up) are dynamic and PNF, since in TeamGym are predominant the muscle contractions in stretch-shortening cycle. The values from the candidates to FMH demonstrates that flexibility is not developed adequately in schools, even if boys have a good mean comparing to reference, but we still believe that this Fitnessgram references are the minimal values to be successful in sports that require flexibility.

### References

- Di Cagno, A., Baldari, C., Battaglia, C., Gallotta, M. C., Videira, M., Piazza, M., & Guidetti, L. (2010). Preexercise static stretching effect on leaping performance in elite rhythmic gymnasts. *J Strength Cond Res*, 24(8), 1995-2000.
- Jemni, M., Sands, W. A., Salmela, J., Holvoet, P. & Gateva, M. (2011). *The Science of Gymnastics* (1st ed.). New Yoirk: Routledge.

**Keywords:** Gymnastics; teamgym; flexibility; Coaching.



GERON



## 5. ATIVIDADE FÍSICA E ESTADO NUTRICIONAL NO PROCESSO DE ENVELHECIMENTO

Adriana Carvalho<sup>1</sup>, Daniela Santos<sup>1</sup>, Mónica Morgado<sup>1</sup>, Rita Mouro<sup>1</sup>, Tânia Rodrigues<sup>1</sup>, Francisco Mendes<sup>1</sup>, Emília Martins<sup>1</sup>, Rosina Fernandes<sup>1</sup>

<sup>1</sup> Instituto Politécnico de Viseu, Portugal

### **Introdução**

A atividade física e um bom estado nutricional constituem elementos benéficos para o processo de envelhecimento. De acordo com Melo, Gomes e Candeias (2010) estes fatores diminuem a incapacidade física e acarretam outros benefícios para a saúde, prevenindo várias doenças.

### **Metodologia**

Procurou-se perceber a relevância de variáveis sociodemográficas na prática de atividade física e no estado nutricional de 134 pessoas idosas não institucionalizadas. Explorou-se ainda a relação entre estes fatores, bem como a sua relevância na saúde e satisfação com a vida. Os dados foram recolhidos com um questionário sociodemográfico, o Questionário de Baecke Modificado (QBM) e o Mini Nutritional Assessment (MNA). Foram realizadas análises descritivas e inferenciais no Statistical Package for the Social Sciences (SPSS - IBM 22).

### **Resultados**

Verificou-se a importância de variáveis sociodemográficas na prática de atividade física. A existência de doenças não teve relevância mas a percepção subjetiva de saúde mostrou-se associada à atividade física e ao estado nutricional (ambos correlacionados entre si). A satisfação com a vida associou-se apenas à idade.

### **Conclusões**

A compreensão destes aspetos é fundamental na implementação de estratégias de promoção de um envelhecimento satisfatório, especificamente se atendermos ao contínuo aumento das taxas de envelhecimento.

### **Referências:**

Melo, M., Gomes, L., & Candeias, A. (2010, dezembro). A Atividade Física no idoso - contributos para uma vida melhor. Poster apresentado no VII Congresso Nacional de Gerontologia, Porto

**Keywords:** Atividade física; estado nutricional; envelhecimento.

# 7. PREDIÇÃO DE DESVIOS POSTURAIS A PARTIR DO GRAU DE ASSOCIAÇÃO ENTRE ASSIMETRIAS POSTURAIS EM CRIANÇAS E JOVENS FUTEBOLISTAS

Pedro Forte<sup>1</sup>, Tiago M Barbosa<sup>2,3</sup>, Jorge E Morais<sup>1,2</sup>, António M Reis<sup>1,2</sup>

<sup>1</sup> Instituto Politécnico de Bragança, Bragança, Portugal

<sup>2</sup> Centro de Investigação em Desporto Saúde e Desenvolvimento Humano, Portugal

<sup>3</sup> Nanyang Technological University, Singapore

## Introdução

A incidência de desvios posturais e dos seus fatores de risco em crianças e jovens em fase de crescimento em certos contextos de prática desportiva intensa e repetitiva parece ser cada vez mais comum nos dias de hoje. Reforça-se a necessidade de os programas de treino nestas populações serem cada vez mais orientados no sentido de minimizar os efeitos deletérios para a postura que certas práticas desportivas, como o caso do futebol, parecem predispor os jovens praticantes. Considerando as teorias habitualmente explicativas das assimetrias posturais (teoria ascendente e descendente) foi nosso propósito verificar a magnitude e sentido das associações entre a tipologia das assimetrias posturais verificadas em crianças e jovens futebolistas como forma de sugerir dados indiciadores do tipo de desvios posturais de que possam vir a sofrer jovens futebolistas.

## Métodos

A amostra deste estudo transversal foi composta por 47 futebolistas do sexo masculino com idades compreendidas entre os 9 e os 16 anos (13.02 + 2.51). Para a avaliação postural foi utilizado o *software* SAPo com um protocolo adaptado às estruturas anatómicas mais utilizadas no futebol. Recorrendo ao teste de correlação de *Spearman* procurou-se verificar associações entre as diferentes tipologias de assimetrias identificadas.

## Resultados

Os lóbulos apresentaram correlação fraca (CF) com as espinhas ilíacas ântero-superiores ( $\rho = 0.32$ ;  $p = 0.03$ ) e CF com a assimetria dos processos espinhosos C7-T3 na vista posterior do plano frontal (VPPF) ( $\rho = 0.41$ ;  $p < 0.01$ ). Os acrómios apresentaram correlação moderada (CM) negativa com os maléolos mediais ( $\rho = -0.34$ ;  $p = 0.02$ ). A linha articular do joelho apresentou CF significativa com a assimetria entre a C7-L1 ( $\rho = 0.30$ ;  $p = 0.04$ ), C7-T3 ( $\rho = 0.44$ ;  $p < 0.01$ ), L1-L5 ( $\rho = 0.36$ ;  $p = 0.01$ ) na VPPF, linha média da perna ( $\rho = 0.32$ ;  $p = 0.03$ ) e uma CM negativa com a linha média da perna ( $\rho = -0.31$ ;  $p = 0.04$ ).

## Conclusão

O aumento da prevalência de assimetrias nos lóbulos, está associada à prevalência de assimetrias nas espinhas ilíacas ântero-superiores e com a diferença horizontal entre os processos espinhosos C7-T3 VPPF. O aumento da prevalência de assimetrias dos acrómios parece reduzir a prevalência das mesmas nos maléolos laterais e vice-versa, verificando o mesmo pressuposto entre a linha articular do joelho e a linha média da perna. O aumento da prevalência da linha articular do joelho parece estar associado ao aumento da mesma na linha média da perna e na prevalência de diferenças horizontais na C7-L1, C7-T3 e L1-L5 na VPPF. Parece pertinente descrever as associações possíveis entre as prevalências de assimetrias nas diferentes modalidades bem como controlar a magnitude dos desvios posturais. As exigências específicas do treino aliadas a um mau controlo e qualidade do mesmo podem ser danosas para a saúde dos praticantes nomeadamente na prevalência de assimetrias posturais.

**Keywords:** Postura; Assimetrias; Prevalência; Crianças; Jovens; Futebol.

## 12. TREINO MULTICOMPONENTE EM IDOSOS ATIVOS: EFEITOS DE UMA SESSÃO DE TREINO DE FORÇA COMPLEMENTAR NA APTIDÃO MUSCULAR, FUNCIONAL E SUA RETENÇÃO APÓS CESSAÇÃO

Pires, Sílvia<sup>1</sup>; Fonseca, Alexandra<sup>2</sup>; Júnior António<sup>2</sup>; Vila-Chã, Carolina<sup>1,3</sup>

<sup>1</sup>Instituto Politécnico da Guarda, Guarda, Portugal; <sup>2</sup>Câmara Municipal da Guarda, Guarda, Portugal

<sup>3</sup>Research Center in Sports Sciences, Health and Human Development (CIDESD), Portugal

### Introdução

Com o envelhecimento ocorre o decréscimo da força muscular e das capacidades funcionais que podem ser atenuadas com atividade física para um envelhecimento mais ativo e promotor de saúde (Taylor & Johnson, 2008). O objetivo deste estudo foi verificar o efeito de 12 semanas de treino multicomponente (adição de uma sessão semanal de treino de força) e destreino (10 semanas) na força máxima (1RM), na potência muscular e nas capacidades funcionais de idosos ativos.

### Metodologia

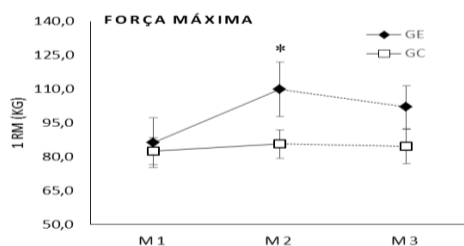
22 idosos voluntários praticantes de hidroginástica (média = 68,5 ± 5,13), divididos em dois grupos GE (n=14) e o GC (n=8). O GE foi submetido ao um treino adicional multicomponente progressivo de 9 exercícios, com 50-85% de 1RM e 2 séries de 6-15 reps. Para a avaliação da aptidão física e funcional foram realizados testes de 1RM e potência muscular (20%, 40% e 60% 1RM) dos membros inferiores, e os testes da bateria de Fullerton (Rikli, 1997).

### Resultados

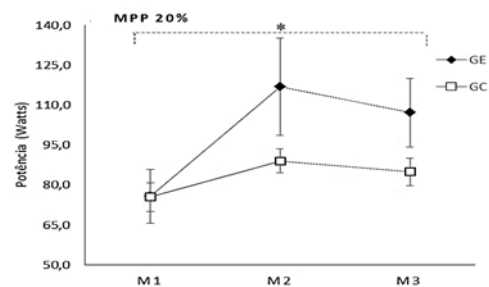
O GE revela um aumento da força máxima (+ 30% após treino,  $P \leq 0,001$ ; e +22% após destreino  $P \leq 0,02$ ), da potência média muscular 20% (entre 46% a 52%;  $P \leq 0,00$ ). O GC não apresentou alterações significativas nas duas componentes referidas anteriormente.

### Conclusões

O treino multicomponente é recomendado para estas populações por apresentar efeitos positivos após o treino e ser capaz de manter uma aptidão muscular e funcional mais elevada após paragens prolongadas do treino.



**Figura 1** - Força máxima dos membros inferiores valores médios e respetivo erro padrão dos valores obtidos no teste 1 RM pré-treino (M1); após-treino (M2) e após-destreino (M3) para o grupo experimental (GE) e grupo controlo (GC). \* para o GE, o M1 diferente de M2 ( $P \leq 0,001$ ) e de M3 ( $P \leq 0,02$ ).



**Figura 2** - Potência propulsiva média a 20% 1RM (MPP) e respetivo erro padrão do grupo experimental (GE) e grupo controlo (GC) pré-treino (M1) após treino (M2) e após destreino (M3). \* - o M1 é diferente de M2 ( $P \leq 0,000$ ) e de M3 ( $P \leq 0,000$ ).

### Referências

- Rikli, R. E. J., C.J. (1997). Assessing physical activity performance in independent older adults: issues and guidelines. *Journal of Aging and Physical Activity* (5), 241-261.
- Taylor, A., & Johnson, M. (2008). *Physiology of exercise and healthy aging: Human Kinetics. Guidelines. Journal of Aging and Physical Activity* (5), 241-261.

**Keywords:** treino multicomponente; idosos; força máxima; potência.

# 13. OBESITY, MUSCLE STRENGTH AND CARDIORESPIRATORY FITNESS IN THE ELDERLY

Silva B<sup>1</sup>, Camões M<sup>1,2</sup>, Fernandes F<sup>1</sup>, Rodrigues TM<sup>1</sup>, Costa NMC<sup>1</sup>, Simões M<sup>1</sup>, Bezerra P<sup>1,2</sup>

<sup>1</sup> School of Sport and Leisure - Viana do Castelo Polytechnic Institute, Portugal

<sup>2</sup> Research Center in Sports Sciences, Health and Human Development (CIDESD), Portugal

## Introduction

Recent studies have reported that BMI between 25 and 30 kg/m<sup>2</sup> are inversely associated with morbidity and mortality, in older persons (Donini et al., 2012; Woo, Yu, & Yau, 2013). The factors that may lead to it are not well established. The aim of this study was to analyse the BMI classes related differences on upper and lower body muscle strength and cardiorespiratory fitness.

## Methods

Cross-sectional study, with a total of 1338 subjects (69.2% women), mean (sd) age of 78.3 (6.2) years, recruited from Viana do Castelo region, north of Portugal. Trained technicians measured the weight (kg) and height (meters) and BMI was calculated (kg/m<sup>2</sup>). Individuals were categorized into: Normal Weight - BMI <25kg/m<sup>2</sup>; Overweight - BMI between 25-30 kg/m<sup>2</sup>; and Obesity - BMI >30kg/m<sup>2</sup>. Muscle strength (kg) of the upper limbs was assessed as Handgrip Test (HandT); muscle strength of the lower limbs was evaluated as Isometric Knee Extension Test (IKE); and the cardiorespiratory fitness as 6-minute walk test (6MWT). Due to different proportions of males between groups of BMI, stratification by gender was done. Kruskal-Wallis test was used to verify the significant differences of the medians in the physical fitness tests, between BMI groups. Significance was set at *p value*<0.05.

## Results

When compared with the normal weight group, the obese women showed better results for the HandT (*p*=0.002) and the overweight group had higher values in the IKE (*p*=0.026) test. However, after adjusting the strength for the weight of the individuals (strength/weight ratio), the normal weight group, showed a significantly better upper and lower strength (*p*<0.05), than the other groups, in both sexes. Normal weight individuals had better performance in the 6MWT, in both genders.

**Table 1** – Relationship between physical fitness and weight classes according to gender.

BMI	Women			Men		
	Normal Weight	Overweight	Obesity	Normal Weight	Overweight	Obesity
n (%)	165 (70,5)	369 (62,5)	393 (76,3)	69 (29,5)	221 (37,5)	122 (23,7)
Median (range)						
Handgrip Test (kg)	20,00 (6,8)	21,8 (8,0)	22,3 (7,0)***	31,5 (12,8)	33,0 (12,0)	32,0 (13,0)
Strength to weight to ratio	0,38 (0,12) †	0,35 (0,12) ††	0,29 (0,09)	0,51 (0,17) †††	0,35 (0,14) ††	0,35 (0,15)
Isometric Knee Extension (kg)	21,4 (12,8)	22,4 (12,8)**	23,7 (12,6)	37,6 (13,2)	41,8 (14,6)	40,8 (15,4)
Strength to weight to ratio	0,39 (0,38) †	0,35 (0,2) ††	0,29 (0,16)	0,62 (0,26) *	0,57 (0,26) ††	0,46 (0,23)
6 Minute Walk Test (meters)	353,2 (215,6)*	346,0 (190,0)	311,0 (212,3)	418,5 (181,0) *	406,0 (176,5)	376,0 (138,3)

\* Statistical significant differences between Normal Weight group and Obesity group; \*\* Statistical significant differences between Overweight group and Normal Weight group;

\*\*\* Statistical significant differences between Obesity group and Normal Weight group; † Statistical significant differences between Normal Weight group and Overweight; †† Statistical significant differences between Overweight group and Obesity group; †††Statistical significant differences between Normal Weight group and Overweight and Obesity groups;

## Conclusion

Normal weight older subjects showed better upper and lower body muscle strength and cardiorespiratory performance.

**Acknowledgement:** This study was funded by the Fundação para a Ciência e Tecnologia, PTDC/DTP-DES/0209/20912.

## References

Donini, L. M., Savina, C., Gennaro, E., De Felice, M. R., Rosano, A., Pandolfo, M. M., et al. (2012). A systematic review of the literature concerning the relationship between obesity and mortality in the elderly. *J Nutr Health Aging*, 16(1), 89-98.

Woo, J., Yu, R., & Yau, F. (2013). Fitness, fatness and survival in elderly populations. *Age (Dordr)*, 35(3), 973-984.

**Keywords:** Obesity; Muscle Strength; Cardiorespiratory Fitness; Elderly.

# 14. EXERCISE AND PERCEIVED HEALTH STATUS IN THE ELDERLY: DIFFERENT SOCIAL AND BEHAVIORAL CONTEXTS

Fernandes F<sup>1</sup>; Camões M<sup>1,2</sup>; Silva B<sup>1</sup>; Rodrigues TM<sup>1</sup>; Costa NMC<sup>1</sup>; Simões M<sup>1</sup> Bezerra P.<sup>1,2</sup>

<sup>1</sup> School of Sport and leisure - Viana do Castelo Polytechnic Institute (ESDL-IPVC), Portugal

<sup>2</sup> Research Center in Sports Sciences, Health and Human Development (CIDESD), Portugal

## Introduction

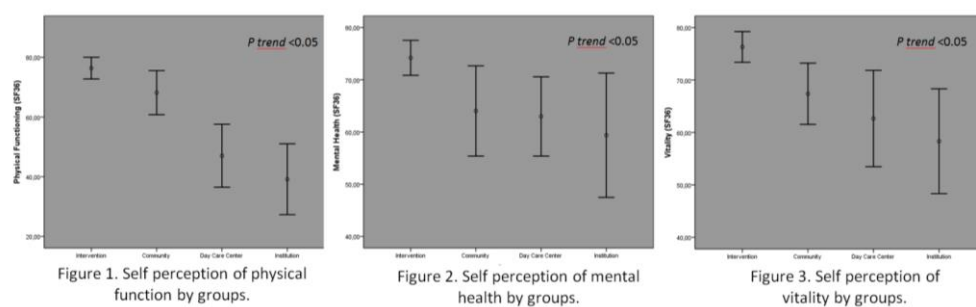
It has been reported a relationship between exercise and better perception of health status in older persons. However, few studies with exercise interventions in less controlled community context support this association (Vagetti et al., 2014). The present study describes the perceived health status of individuals over 70 years, taking into account the participation level in exercise programs, in both community and institutionalized context.

## Methods

Cross-sectional study, with a total of 250 subjects (74.8% female), recruited from north of Portugal region, and evaluated according 4 different contexts. Group 1 (n=148) include community older subjects involved in an exercise program (frequency: 2 sessions/week; time: 45 minutes); Group 2 (n=41) contain elderly who belong to the community but not involved in regular physical activity; Group 3 (day care center, n=37) and group 4 (institution, n=24), aggregate elderly people who attend or are in care centers and did not exercise. The questionnaire 36-item Short Form health survey (SF-36), validated for Portuguese population, was used to evaluate perceived health status. Eight domains of the SF-36 were analysed: General Health (GH), Physical Functioning (PF), Role Physical (RP), Role Emotional (RE), Bodily Pain (BP), Social Functioning (SF), Mental Health (MH) and Vitality (VT). ANOVA was performed to analyze variance of continuous variables and multiple linear regression to test the trends between groups. Significance was set at  $p$  value < 0.05.

## Results

Significant differences were found in the mean scores (sd) for the PF domain, between the groups analyzed (group 1: 76.4 (22.4); group 2: 68.2 (23.3); group 3: 47.0 (31.6) and group 4: 39.2 (28.1)). Similar distributions to those previously mentioned, were found for the MH and VT domains, with significant differences between groups ( $p = 0.001$ ). Among the same domains, significant trends ( $p$  for trend < 0.05) were observed with the best results of perceived health status consistently belong to the elderly enrolled in exercise program (Figure 1, 2, 3), independently of the gender and age.



## Conclusion

Intervention programs based on physical exercise, even with short frequency and duration, are related with better perception on physical function, mental health and vitality.

**Acknowledgement:** This study was funded by the Fundação para a Ciência e a Tecnologia, PTDC/DTP-DES/0209/2012.

## References

Vagetti, G., Barbosa Filho, V., Moreira, N., Oliveira, V., Mazzardo, O., & Campos, W. (2014). Association between physical activity and quality of life in the elderly: a systematic review, 2000-2012. *Revista Brasileira de Psiquiatria*, 36(1), 76-88.

**Keywords:** Exercise; SF36 Quality of life; Elderly.

## 20. INFLUENCE OF PHYSICAL ACTIVITY ON MUSCLE STRENGTH AND CARDIORESPIRATORY FITNESS IN OBESE ELDERLY: A COMPARISON WITH SEPTUAGENARIANS, OCTOGENARIANS AND NONAGENARIANS

Rodrigues, TM<sup>1</sup>; Rodrigues, LP<sup>1,2</sup>; Costa, NMC<sup>1</sup>; Silva, B<sup>1</sup>; Fernandes, F<sup>1</sup>; Bezerra, P<sup>1,2</sup>

<sup>1</sup>IPVC (Viana do Castelo, Portugal)

<sup>2</sup>CIDESD (Portugal).

### Introduction

Extensive literature has reported that physical activity (PA) elderly have a better quality of life, higher levels of muscular strength and physical capacity. Obesity is recognized as a major global public health problem, not only by the number of people involved but also for the diseases associated with it. The purpose of this study is to investigate the variations of the three components of physical fitness - manual strength, lower strength and cardiorespiratory fitness - in obese and non-obese with and without physical activity practice, with seventy or more years.

### Methods

The sample is constituted by 1053 healthy elderly (68.4% women and 31.6% men, 39% obese and 61% non-obese, 60% practice PA and 40% not practice PA) subdivided in septuagenarians (74.2 ± 2.8), octogenarians (83.5 ± 2.6) and nonagenarians (92.1 ± 1.7), in the district of Viana do Castelo. In this study were considered "Obese" individuals with a Body Mass Index greater or equal than 30kg/m<sup>2</sup>, and as having regular PA all who attend two or more sessions/week of PA - PA group and nPA group. The assessment of physical fitness was done with the handgrip, knee extension and six minute walk test. For statistical analysis was used the t test for independent samples with a significance level of 0.05. The study was approved by the Scientific Council of the Polytechnic Institute of Viana do Castelo.

### Results

In group "non-Obese" (<30 kg/m<sup>2</sup>), individuals with regular PA present statistically higher values than their peers without regular PA, in the hand strength (70'- 29.0 ± 8.4, 26.7 ± 8.9, p = 0.022; 80' - not significant; 90'- 22.4 ± 8.3, 16.6 ± 5.4, p = 0.006), in knee extension (70'- 35.0 ± 14.8, 29.9 ± 15.3, p = 0.003; 80'- 26.2 ± 12.7, 21.8 ± 11.6, p = 0.004; 90'- 24.3 ± 8.5, 16.4 ± 7.6, p = 0.001) and in 6-minutes walk (434.9 ± 70'- 122.7, 355.7 ± 110.3, p <0.001; 80'- 321.3 ± 119.2, 272.8 ± 112.7, p = 0.001; 90'- 276.6 ± 108.0, 212.3 ± 90.9, p = 0.03). In "Obese" (>30 kg/m<sup>2</sup>) although the subjects with regular PA have showed higher values than their peers without regular PA in hand strength, knee extension, being that the results are only statistically significant at the walk of 6 minutes in septuagenarians (396.5 ± 103.8, 330.8 ± 98.2, p <0.001) and octogenarians (257.0 ± 122.8, 205.7 ± 115.9, p = 0.014).

### Conclusion

These results highlight the importance of PA practice in improving cardiorespiratory fitness in individuals obese and non-obese. The mean strength, upper and lower, diminishes with age, but this reduction is more marked in individuals who do not perform PA, both in the obese as non-obese group. The subjects non-obese both those who practice PA as nPA, have better values in terms of hand strength, knee extension and 6-minute walk than their obese pairs. Although aging has been associated with a decline in physical fitness, it can be concluded that regular PA plays a key role in mitigating this decline, regardless of the individual's body composition.

**Keywords:** obesity; elderly; physical activity; muscle strength; cardiorespiratory fitness.

## 21. MARRIED COUPLE CONCORDANCE IN MENTAL PERCEPTION AND PHYSICAL FITNESS

Costa, NMC<sup>1</sup>, Rodrigues, LP<sup>1,2</sup>, Rodrigues, TM<sup>1</sup>, Fernandes, F<sup>1</sup>, Silva, B<sup>1</sup>, Simões, M<sup>1</sup>, Bezerra, P<sup>1,2</sup>

<sup>1</sup>Viana do Castelo Polytechnic Institute (IPVC), Portugal

<sup>2</sup>Research Center in Sports Sciences, Health Sciences and Human Development (CIDESD), Portugal

### Introduction

Married couple similar routine (nutrition, daily activities, stress management, physical and cognitive activity) and the social support they provide each other may have an impact in mental and physical capacities. Therefore, the aim of this study was to investigate married couple mutual influences, in the mental perception and in the physical fitness.

### Methods

One thousand and sixty participants (723 female and 337 male) with 70 years and more were recruited from Viana do Castelo. From these, 35 random couples were analyzed for concordance. Mental auto-perception of enthusiasm, motivation, aliveness, energy and the absence of fatigue was accessed through the vitality condition from the SF36v2 questionnaire. Physical fitness (PF) was accessed as handgrip test (HG), isometric Knee Extension Test at 90° (KneeT) and six minutes walking test (6MW). The values were normalized, and positive scores were set to 50% and up, and negative scores were set to less than 50%. Under these conditions 4 groups were defined: +Women, +Men (A) – positive concordance between women and men; +Women, -Men (B); -Women, +Men (C); -Women, -Men (D) – negative concordance between women and men. Descriptive statistics were used to identify groups by test.

### Results

Quantification of each group reveals that 1) positive concordance is predominant in both the PF tests and the auto-perception of VT, 2) C is the second group with more predominance in all the tests, 3) by defining A+D as couple concordance (spouses with the same classification) and B+C discordance, it was found that A+D is higher in all the tests (Table 1).

Table 1: Group quantification by test.

Group	HG	KneeT	6MW	VT
A	24(68.5%)	11(31.4%)	24(68.5%)	27(77.1%)
B	1(2.9%)	7(20%)	2(5.7%)	0(0.0%)
C	10(28.6%)	10(28.6%)	8(22.9%)	8(22.9%)
D	0(0.0%)	7(20%)	1(2.9%)	0(0.0%)
<b>A+D (concordant)</b>	<b>24 (68.5%)</b>	<b>18(51.4)</b>	<b>25(71.4)</b>	<b>20(57.1%)</b>
<b>B+C (discordance)</b>	<b>11(31.5%)</b>	<b>17(48.6)</b>	<b>10(28.6%)</b>	<b>15(42.9%)</b>

### Conclusion

Our findings suggest that married couples have more concordance than discordance, therefore an inter-influence between spouses seems plausible. In this case, the influence is more positive than negative (A > D). In addition, as group C has high occurrence, probably husbands with positive scores don't interfere in the scores of their partners.

**Keywords:** Elderly; Married Couple; Mental Perception; Physical Fitness; Vitality.



## 23. INCLUSÃO NO DESPORTO: PERCEÇÃO DO AUTOCONCEITO EM ADOLESCENTES INSTITUCIONALIZADAS NA CIDADE DE BRAGANÇA

Vinhas, A.<sup>1,2</sup>; Lopes, A.<sup>1,2</sup>; Gonçalves, C.<sup>2</sup>

<sup>1</sup>Faculdade de Desporto da Universidade do Porto, Porto, Portugal

<sup>2</sup>Instituto Politécnico de Bragança, Bragança, Portugal

### Introdução

O Desporto para todos é um fator potenciador de inclusão social permitindo as pequenas minorias de beneficiarem de um nível de vida e bem-estar considerado regular na sociedade em que vivem (Bouchard et al., 1990). As adolescentes institucionalizadas caracterizam-se pela falta de capacidades na adaptação às exigências habituais da sociedade empurrando-as para um comportamento de inadaptação, marginalização e autoexclusão (Oliveira, 2002). As características desta população aliada aos aspetos positivos da atividade física organizada parecem melhorar os níveis de competência física, aparência física, comportamento, autoestima e também a melhoria do desempenho escolar. Desta forma, este estudo tem como objetivo perceber a influência de um programa de atividade física no auto conceito de adolescentes institucionalizadas.

### Método

Implementou-se um programa, com aulas de academia, que decorreu de janeiro a junho, duas vezes por semana, num ginásio da cidade de Bragança – *Brifitness Gym* –. Foram recolhidos dados, através de questionário, em dois momentos distintos: no início do programa (janeiro) e no final do programa (julho), com uma amostra de 13 adolescentes do sexo feminino, com média dos 15 anos e com frequência no ensino secundário. O tratamento estatístico foi realizado através de análise descritiva e análise inferencial.

### Resultados

Dos resultados iniciais, podemos destacar que a atividade física tem influência na imagem corporal. Sobretudo através das dimensões aparência física, competência física, autoestima global, comportamento e socialização, influenciando o autoconceito das adolescentes para a sua vida no futuro. A competência cognitiva, embora importante, aparece como menos relevante na imagem corporal.

### Conclusão

Parte do objetivo já foi conseguido porque a participação no programa de atividade física servia como compensação ao bom comportamento influenciando a conduta atual. Assim, parece premente que as instituições de acolhimento incluam a atividade física nos seus planos de acolhimento não só para melhorar a conduta atual mas sobretudo para a sua orientação para a vida adulta.

### Referências

Bouchard, C.; Sherrard, R.; T. Stphens; J. Sutton; B. McPherson (Eds). *Exercise, Fitness and Health: A Consensus of Current Knowledge*. Champaign, IL, Human Kinetics, pp. 3-9.  
Oliveira, R. C. (2002). *101 perguntas e resposta sobre abandono e institucionalização*. São Paulo: CeCIF.

**Keywords:** atividade física; *fitness*; adolescência; autoconceito; instituições de acolhimento.

## 27. OBESIDAD INFANTIL Y PARÁMETROS DE COMPOSICIÓN CORPORAL EN NIÑOS DE EXTREMADURA (ESPAÑA)

Marta Marcos<sup>1</sup>, Alba Camacho<sup>1</sup>, Alejandro Carrascal<sup>1</sup>, Armando Raimundo<sup>2</sup>, Guillermo Olcina<sup>1</sup> and Rafael Timón<sup>1</sup>

<sup>1</sup> Universidad de Extremadura, Spain

<sup>2</sup> Universidad de Évora, Portugal

### Introducción

En las sociedades desarrolladas la obesidad es uno de los trastornos nutricionales más frecuente en la infancia y la adolescencia (Serra Majem, 2003) y el quinto factor principal de riesgo de defunción en el mundo (Fernández-Bergés, 2012). Estudios previos establecen que 2 de cada 10 niños/as extremeños padecen obesidad o sobrepeso (Torres, 2008). El objetivo del estudio es describir la prevalencia de la obesidad en escolares extremeños y conocer la influencia de la obesidad sobre factores de parámetros de composición corporal.

### Métodos

242 niños/as (9 a 12 años) de centros de primaria de la Comunidad Autónoma de Extremadura fueron evaluados. Tras informar y recibir el consentimiento informado de los tutores legales de los sujetos, se llevaron a cabo mediciones individuales de parámetros antropométricos: peso, talla, IMC, masa grasa, masa libre de grasa, % grasa y peso óseo, índice cintura-cadera. Se llevó a cabo un análisis descriptivo para conocer el porcentaje de obesidad entre los escolares y un ANOVA de un factor con un test post hoc para comparar los resultados con los tres niveles del factor de estudio (normopeso, sobrepeso y obesidad).

### Resultados

El 9,9% de los niños/as extremeños evaluados eran obesos, siendo este porcentaje mayor en el caso de los niños (11,2% frente a 8,54% de las niñas). Existen diferencias significativas ( $p > 0.05$ ) en cuanto al nivel de composición corporal en las variables IMC, ICC, masa grasa y % masa grasa.

### Conclusiones

18% escolares extremeños presenta sobrepeso u obesidad, valor que se ha mantenido constante en los últimos años. Los niños/as con sobrepeso y obesidad presentan mayores niveles de IMC, ICC y niveles de grasa corporal.

### Referencias

- Fernández-Bergés, D., Cabrera de León, A., Sanz, H., Elosua, R., Guembe, M. J., Alzamora, M., & Marrugat, J. (2012). Síndrome metabólico en España: prevalencia y riesgo coronario asociado a la definición armonizada ya la propuesta por la OMS. Estudio DARIOS. *Revista Española de Cardiología*, 65(3), 241-248.
- Serra Majem, L. L., Ribas Barba, L., Pérez Rodrigo, C., Román Viñas, B., Aranceta, J. (2003). Hábitos alimentarios y consumo de alimentos en la población infantil y juvenil española (1998-2000): variables socioeconómicas y geográficas. *Medicina clínica*, 121(4), 126-131.
- Torres, M. D., Tormo, M. A., Campillo, C., Carmona, M. I., Torres, M., Reymundo, M., García, P., Campillo J. E. (2008). Factores etiológicos y de riesgo cardiovascular en niños extremeños con obesidad. Su relación con la resistencia a la insulina y la concentración plasmática de adipocitocinas. *Revista Española de Cardiología*. 61(9): 923-9.

**Keywords:** children; obesity; anthropometry.

## 29. EVALUACION DE LA SARCOPENIA EM SUPERVIVIENTES DE CANCER

Celia Aparecida da Silva<sup>1</sup>, Cintia Campolina Duarte Rocha da Silva<sup>1,2</sup>, Sandro Fernandes da Silva<sup>1</sup>, Claudia Eliza Patrocínio de Oliveira<sup>3,4</sup>, Osvaldo Costa Moreira<sup>4,5</sup>

<sup>1</sup>Grupo de Estudo e Pesquisa em Respostas Neuromusculares – GEPREN- Universidade Federal de Lavras – UFLA – Lavras, MG, Brasil

<sup>2</sup>Faculdade Presbiteriana Gammon – FAGAMMON, Lavras, MG, Brasil

<sup>3</sup>Departamento de Educação Física – Universidade Federal de Viçosa – UFV – Viçosa, MG, Brasil

<sup>4</sup>Instituto de Biomedicina – Universidad de León – ULe – León, España

<sup>5</sup>Instituto de Ciências Biológicas e da Saúde – Universidade Federal de Viçosa Campus Florestal – Florestal, MG, Brasil

### Introducción

El incremento de actividades físicas en la rutina diaria de individuos con cáncer, viene se tornando diana de investigación en que relatan los beneficios del ejercicio (Gould et al., 2013), a sí siendo es necesario una mayor énfasis en investigar los beneficios de ese tipo de intervención. Estimar el nivel de sarcopenia en supervivientes de cáncer participantes de un programa de ejercicio físico.

### Métodos

La muestra fue compuesta por 12 supervivientes de cáncer (8 hombres y 4 mujeres), con un promedio de edad de  $64,62 \pm 13,80$  años, participantes de un programa de actividad física dos veces por semana con duración de 90 minutos durante 6 meses. Para estimar la composición corporal fue utilizada la bioimpedancia RJA Systems®. Sarcopenia: Para estimar la sarcopenia fue adoptada la ecuación propuesta por Janssen et al., (2000), y a partir de esa ecuación, es posible calcular el Índice de Masa Muscular (IMM). El análisis estadístico fue hecho a través de la comparación de promedios y desviación estándar. Para identificar las diferencias entre los sexos fue utilizado el test no paramétrico de Mann-Whitney. Para la comprobación estadística fue adoptado un  $p < 0,05$ .

### Resultados

Los hombres presentaron un IMM de  $9,0 \pm 0,64$  Kg/m<sup>2</sup>, el que representa un grado de sarcopenia clase I, el IMM de las mujeres fue de  $7,5 \pm 0,57$  Kg/m<sup>2</sup>, el que significa un grado normal de sarcopenia. Con los resultados no fue posible identificar diferencia significativa entre los sexos.

### Conclusión

Con los resultados fue posible identificar que los hombres poseen un nivel de sarcopenia, ya las mujeres están localizadas en una clase normal. Se hace necesario profundizar todavía más estudios localizar en esa muestra, principalmente verificando los efectos de un programa de actividad física en la sarcopenia.

### Referencias

GOULD, D. W. et al. Cancer cachexia prevention via physical exercise: molecular mechanisms. Journal of cachexia, sarcopenia and muscle, v. 4, n. 2, p. 111-124, 2013. ISSN 2190-5991.

JANSSEN, I. et al. Estimation of skeletal muscle mass by bioelectrical impedance analysis. Journal of Applied Physiology, v. 89, n. 2, p. 465-471, 2000. ISSN 8750-7587.

**Keywords:** Actividad Física; Masa Muscular; Calidad de Vida.

## 32. ADEQUABILIDADE DE DOIS TESTES ABDOMINAIS E A RELAÇÃO DESTES COM A FLEXIBILIDADE E VARIÁVEIS ANTROPOMÉTRICAS EM MULHERES MAIORES DE 55 ANOS

Cláudia E.P. de Oliveira<sup>1</sup>, Osvaldo C. Moreira<sup>1</sup>, Sylvia C. C. Franceschini<sup>1</sup>, Eveline T. Pereira<sup>1</sup>; Nádia S. L. da Silva<sup>2</sup>, Leonice A. Doimo<sup>1</sup>

<sup>1</sup>Universidade Federal de Viçosa, Viçosa, Brasil

<sup>2</sup>Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil

### Introdução

Diante da importância que a musculatura abdominal apresenta para a saúde e, tendo em vista a inexistência de um teste abdominal específico para a população a partir de 55 anos, objetivou-se avaliar a adequabilidade do teste de abdominal proposto por Sidnei & Jetté (1990) (T1) e uma adaptação do mesmo (T2), em mulheres maiores de 55 anos e relacionar o desempenho obtido nesses dois testes com a flexibilidade, índice de massa corporal (IMC), perímetro de cintura (PC) e relação cintura/quadril (RCQ).

### Métodos

Foram avaliadas 185 mulheres, com idades a partir de 55 anos, praticantes e não praticantes de atividades físicas. Os critérios de inclusão foram: participação voluntária, independência funcional e ausência de alterações músculo-articulares e pressóricas. Cada avaliada realizou os dois testes abdominais, sendo o T1 proposto por Sidnei & Jetté (1990) e o T2, uma adaptação do T1, em que se alterou a marcação do ponto anatômico para contar tentativas válidas, realizado originalmente com flexão dos joelhos, para a realização com joelhos estendidos. Realizaram-se medidas de peso, estatura, perímetros de cintura e quadril, flexibilidade e cálculos do IMC e RCQ. O tratamento estatístico constou da análise descritiva; do teste qui-quadrado ( $\chi^2$ ), para verificar a associação entre desempenho e as variáveis estudadas; Odds Ratio (OR) para verificação da magnitude de associação, com intervalo de confiança de 95%. Utilizou-se Mann-Whitney para verificar a diferença entre os desempenhos dos testes e a correlação de Pearson para verificar a correlação do desempenho com as demais variáveis. Adotou-se nível de significância de  $p < 0,05$ .

### Resultados

Os valores medianos para tentativas válidas foram 1,065 para o T1 e 8,219 para o T2, sendo que 89% das voluntárias não obtiveram tentativas válidas no T1, enquanto 33,33% delas conseguiram, ao menos, uma tentativa válida no T2. Observou-se associação negativa ( $\chi^2=28,24$ ;  $p < 0,0001$ ) do T1 em relação à T2 para a realização de tentativas válidas, sendo que as voluntárias que realizaram T2 tiveram 4,13 (2,32 <OR< 7,41) vezes mais chance de realizar uma tentativa válida em relação ao T1. Correlações entre tentativas válidas, variáveis antropométricas e flexibilidade para o T2 foram: IMC  $r=-0,19$   $p=0,0072$ , PC  $r=-0,197$   $p=0,0009$ , RCQ  $r=-0,156$   $p=0,0345$  e flexibilidade  $r=0,147$   $p=0,0460$ . No T2, IMC<22 não apresentou associação com o desempenho e IMC>27 associou-se negativamente com o número de tentativas válidas (2,07 chances a mais de apresentarem desempenho igual à zero).

### Conclusão

O T1 é o teste menos indicado para a amostra estudada e, embora melhores resultados tenham sido observados no T2, a indicação do mesmo para o público a partir de 55 anos deve ser vista com ressalvas, devido a outras variáveis intervenientes, além da composição corporal.

### Referências

Sidnei, K., Jetté, M. (1990). The partial curl-up to assess abdominal endurance: age and sex standards. *Sports Medicine, Training and Rehabilitation*, 2, 47-56.

**Keywords:** Saúde da mulher; Parede abdominal; Treinamento de força.

## 35. NÍVEIS DE ATIVIDADE FÍSICA EM ADOLESCENTES. A INFLUÊNCIA DOS AMIGOS

Telmo Correia <sup>1</sup>, José Florêncio Sousa <sup>1</sup>, Carla Correia Sá <sup>2</sup> & Vítor P. Lopes <sup>1,2</sup>

<sup>1</sup> Instituto Politécnico de Bragança, Bragança, Portugal

<sup>2</sup> Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano, Bragança, Portugal

### Introdução

É indiscutível o papel da atividade física (AF) para um bom estado de saúde em qualquer idade. Os níveis de atividade física na adolescência são influenciados por um conjunto de fatores, nomeadamente do âmbito social. Na adolescência os amigos são um fator de influência em diversos comportamentos (Macdonald-Wallis, Jago, & Sterne, 2012). O objetivo da presente investigação foi analisar as similaridades dos níveis de AF e sedentarismo entre pares de amigos adolescentes.

### Métodos

Tratou-se de um estudo transversal que decorreu na primavera de 2012, cujos participantes foram adolescentes de ambos os sexos da cidade de Bragança (Portugal), 330 pares de melhores amigos (n=660), sendo 167 melhores amigos recíprocos e 163 melhores amigos não recíprocos, com idades compreendidas entre os 12 e os 21 anos (Média=15,78±1,87 anos de idade). Todos os adolescentes foram avaliados quanto aos seus níveis de AF e de sedentarismo, através de questionário por auto resposta. Os dados foram analisados através da modelação hierárquica linear, testando o Actor-Partner *Interdependence Model* de forma a analisar as semelhanças das díades de melhores amigos no que respeita aos níveis de AF e sedentarismo.

### Resultados

Os resultados indicaram semelhança significativa entre pares de amigos na AF global [CCI=0,23 (p=0,002)] e no tempo sedentário diário (TSD) [CCI=0,39 (p<0,001)], em pares de amigos recíprocos, assim como, no TSD em pares de amigos não recíprocos [CCI=0,21 (p=0,008)].

### Conclusão

Verificou-se que os níveis de AF e sedentarismo foram semelhantes entre pares de melhores amigos adolescentes, designadamente ao nível da AF global em pares de melhores amigos recíprocos, e ainda, ao nível do tempo sedentário diário, quer em pares de melhores amigos recíprocos como em não recíprocos. As intervenções práticas de AF em adolescentes devem ter em consideração os melhores amigos, pois estes podem ser um meio efetivo de influência positiva para a prática, através do apoio social para a AF.

### Referências

Macdonald-Wallis, K., Jago, R., & Sterne, J. A. (2012). Social network analysis of childhood and youth physical activity: a systematic review. *American Journal of Preventive Medicine*, 43(6), 636-642. doi: 10.1016/j.amepre.2012.08.021

**Keywords:** Apoio dos pares; relações pessoais; juventude; reciprocidade; amizade.

# 37. INCREASED PHYSICAL ACTIVITY AND FITNESS ABOVE THE 50TH PERCENTILE PREVENTS THE INSTITUTIONALIZATION OF ELDERLY PEOPLE: A CROSS-SECTIONAL PILOT STUDY

Pereira C<sup>1</sup>, Fernandes J<sup>1</sup>, Raimundo A<sup>1</sup>, Biehl-Printes C<sup>2</sup>, Marmeleira J<sup>1</sup>, Tomas-Carus P<sup>1</sup>

<sup>1</sup>DDS, Escola de Ciências e Tecnologia; Universidade de Évora; CIDESD/Évora; Portugal  
<sup>2</sup>ISCE; Lisbon, Portugal

## Introduction

Institutionalization in a nursing home restricts autonomy, most notably free will, free choice, and free action. Decreased physical activity and fitness are predictive of disability and dependence (Rikli & Jones, 2013; Tak, Kuiper, Chorus, & Hopman-Rock, 2014); however little is known about the impact of these factors on institutionalization. Thus, this study aimed to analyze the impact of physical activity and fitness and on the risk of elderly people without cognitive impairment become institutionalized.

## Methods

This cross-sectional study involved 195 non-institutionalized (80.1±4.4yrs) and 186 institutionalized (83.8±5.2yrs) participants. Cognitive impairment was assessed using Mini-Mental State Examination, physical activity was assessed using the International Physical Activity Questionnaire, and measures of physical fitness were determined by the Senior Fitness Test.

Results: Multivariate binary logistic analysis selected 4 main predictors of institutionalization in both genders. The likelihood of becoming institutionalized increased by +18.6% for each additional year of age, while it decreased by -24.8% by each fewer kg/m<sup>2</sup> in BMI, by -0.9% for each additional meter performed in the aerobic endurance test and by -2.0% for each additional 100MET-min/wk of physical activity expenditure ( $p < 0.05$ ). Values  $\leq 50$ th percentile (age  $\geq 81$ yrs, BMI  $\geq 26.7$ kg/m<sup>2</sup>, aerobic endurance  $\leq 367.6$ m, and physical activity  $\leq 693$ MET-min/wk) were computed using Receiver Operating Characteristics analysis as cut-offs discriminating institutionalized from non-institutionalized elderly people.

## Conclusion

The performance of physical activity, allied to an improvement in physical fitness (mainly BMI and aerobic endurance) may prevent the institutionalization of elderly people without cognitive impairment only if they are above the 50th percentile; the following is highly recommend: expending  $\geq 693$ MET-min/wk on physical activity, being  $\leq 26.7$ kg/m<sup>2</sup> on BMI, and being able to walk  $\geq 367.6$ m in the aerobic endurance test, especially above the age of 80 years. The discovery of this trigger justifies the development of physical activity programs targeting the pointed cut-offs in old, and very old people.

## References

- Rikli, R., & Jones, C. (2013). Development and validation of criterion-referenced clinically relevant fitness standards for maintaining physical independence in later years. *Gerontologist*, 53, 255-267.
- Tak, E., Kuiper, R., Chorus, A., & Hopman-Rock, M. (2014). Prevention of onset and progression of basic ADL disability by physical activity in community dwelling older adults: a meta-analysis. *Ageing Res Rev*, 12, 329-338.

**Keywords:** Physical activity; Physical fitness; Elderly; Institutionalization; Nursing home.

# 40. ANÁLISE DOS BENEFÍCIOS DO PROGRAMA DE REABILITAÇÃO FUNCIONAL UTILIZADO NA UNIDADE DE CUIDADOS CONTINUADOS DE MÉDIA DURAÇÃO DE ARRONCHES EM PESSOAS IDOSAS COM FRACTURA DO COLO FÉMUR

Simeão, A. R<sup>1</sup>; Raimundo, A.<sup>2</sup>; Pereira C.<sup>2</sup>

<sup>1</sup>Unidade de Cuidados Continuados de Média Duração de Arronches, Portugal  
<sup>2</sup>DDS, Escola de Ciências e Tecnologia; Universidade de Évora; CIDESD/Évora; Portugal

## Introdução

As Unidades de Cuidados Continuados de Média Duração (UCCMD) obedecem a um protocolo em que, mediante uma avaliação inicial dos pacientes, é estabelecido um plano individual e são inseridos num Programa de reabilitação até 90 dias. (Decreto-Lei 101/2006) Neste protocolo é sugerido a realização de uma avaliação após 30 dias de internamento (Girão A., 2011).

O objetivo deste estudo foi analisar os Benefícios do Programa de Reabilitação Funcional praticado pela UCCMD de Arronches em Pessoas Idosas com Fratura do Colo Fémur.

## Metodologia

Participaram neste estudo 21 idosos ( $77 \pm 8,4$ ) em recuperação por fratura ao colo do fémur (17 mulheres e 4 homens). Durante 90 dias os participantes integraram o Programa de Reabilitação Funcional utilizado pela UCCMD de Arronches. O programa engloba a intervenção Fitoterapêutica individual e a Reabilitação Psicomotora em grupo. Foram avaliadas as atividades da vida diária (AVDs) básicas usando o Índice de *Barthel* e as instrumentais usando o Índice de *Lawton*, no pré intervenção, após 30 dias de permanência no programa, e à data da alta. A comparação do comportamento das variáveis nestas três avaliações foi realizada através do Teste *Friedman*, seguida da comparação de pares utilizando o Teste *Pairwise*.

## Resultados

Ao longo do Programa, verificaram-se melhorias significativas em todas as AVDs básicas e instrumentais avaliadas, bem como nos *scores* totais do Índice de *Barthel* ( $35.7 \pm 23.7$  vs.  $77.4 \pm 24.3$  vs.  $85.9 \pm 19.5$ ) e do Índice de *Lawton* ( $4.8 \pm 3.0$  vs.  $10.2 \pm 3.2$  vs.  $11.1 \pm 4.3$ ) ( $p < 0.05$ ). As melhorias foram observadas após os 30 dias de intervenção para quase todas as variáveis das AVDs ( $p < 0.05$ ); excetuaram-se as AVDs básicas comer, beber e controlo dos esfíncteres em que as melhorias apenas se observaram da primeira para a última avaliação ( $p < 0.05$ ). Também foram exceção a AVD instrumental gestão da medicação onde apenas se observaram melhorias da primeira para a última avaliação e a AVD gestão do dinheiro em que apenas se encontraram diferenças entre a primeira e a segunda avaliações ( $p < 0.05$ ).

## Conclusões

Com exceção das AVDs associadas às funções biológicas e as AVDs instrumentais gestão da medicação e gestão do dinheiro, as melhorias significativas na capacidade de realização nas AVDs básicas e instrumentais ocorreram da primeira para a segunda avaliação. Estes resultados sugerem a necessidade de um incremento/ajustamento do programa quanto à sua intensidade e solicitações após os 30 dias de intervenção. Estas descobertas também sugerem uma necessidade da existência de maior preparação da alta, pois o eminente abandono da instituição poderá afetar em alguns resultados.

## Referências

Decreto-Lei 101/2006 de 6 de Junho. Diário da Republica N.º 109 — I Série A. Ministério do Trabalho e da Solidariedade Social e Saúde.  
Girão A. (coord.), (2011). Manual do Prestador: Recomendações para a Melhoria Contínua. Lisboa.

**Keywords:** Idade; Agilidade; Exercício físico.

## 49. CONTRIBUTO DA DIDÁTICA DA DANÇA PARA A SATISFAÇÃO DE PRATICANTES IDOSAS

Varregoso, Isabel

*Centro de Investigação em Qualidade de Vida, IP Leiria /IP Santarém, Portugal;  
Escola Superior de Educação e Ciências Sociais, IP Leiria, Portugal*

### **Introdução**

A Dança é reconhecida como uma das práticas mais aconselhadas para idosos. Associa o exercício físico a uma forte componente social e de bem-estar psicológico que contribuem para a qualidade de vida e vida ativa (Varregoso, 2010). A base criteriosa do seu ensino deve versar, para da prescrição do exercício, uma incidência lúdica, recreativa, expressiva e criativa. Estas últimas permitem ao idoso um (re)encontro com a cultura e identidade musicais, uma vivência de divertimento e prazer, uma oportunidade para ser único na sua corporalidade, expressão e relacionamento com o(s) outro(s). A vivência de aulas bem estruturadas ajuda-o a sentir-se seguro, feliz, capaz e a ser mais interventivo na construção do seu envelhecimento.

### **Métodos**

A amostra foi constituída por 27 mulheres (64 e 76 anos de idade), independentes e autónomas. Os procedimentos metodológicos basearam-se num método de terreno, em ambiente natural onde se realizaram aulas de dança uma vez por semana durante um ano letivo. A metodologia de trabalho implicou procedimentos didáticos específicos (conceção da aula, conteúdos, interações e feedback) conducentes ao bem-estar psicossocial. Para a recolha de dados usou-se o instrumento Questionário de Satisfação com as Aulas (Comprido, 2013). Usou-se a medida de pós-tratamento, com uma análise percentual intragrupo.

### **Resultados**

Cerca de 50% das idosas consideraram-se muito satisfeitas com as 'músicas utilizadas' (59%), os 'exercícios de grupo' (50%) e 'de pares' (50%), a 'organização e estrutura da aula' (50%), os 'testes de aptidão funcional' (50%). Consideraram-se muito satisfeitas com 'a atitude do professor' bem como com a forma como este 'explicava' as situações (73%). Quanto às interações, 82% consideraram-se muito satisfeitas com a 'relação professor-grupo' e com a relação 'professor consigo própria'. Também se consideraram muito satisfeitas com o feedback ('acompanhamento do professor' 82%).

### **Conclusão**

O nível de satisfação com as aulas de dança foi bom pois todas as respostas se situaram nos parâmetros 'satisfeito' ou 'muito satisfeito', o que parece reforçar a metodologia usada e o seu contributo para a realização de aulas agradáveis, eficazes e gratificantes.

### **Referências:**

Comprido, A. (2013). Programa SETE. Perspetiva pedagógica para el desarrollo de la aptitud física y calidad de vida de los mayores. *Tesis Doctoral*, Departamento de Ciencias de la Educación, Universidad de Extremadura, Badajoz, Espanha.  
Varregoso, I. (2010). O papel da dança na construção de uma nova cultura acerca do envelhecimento. In R.M. Martins & S.I. Hagen (org.), *Ame todas as Suas Rugas*. Florianópolis, SC: Instituto Ame Suas Rugas, 119-130.

**Keywords:** idosos; dança; ensino; satisfação com aulas



# 50. ISOKINETICS STRENGTH RELATION WITH FEAR OF FALL, FALLS AND PHYSICAL ACTIVITY LEVEL IN ELDERLY WOMEN

Raimundo, A.<sup>1,2</sup>, Correia, P.<sup>1</sup>, Batalha, N.<sup>1,2</sup>, Tomas-Carus, P.<sup>1,2</sup>, Pereira, C.<sup>1,2</sup>

<sup>1</sup> Universidade de Évora, Escola de Ciência e Tecnologia, Departamento de Desporto e Saúde, Évora, Portugal

<sup>2</sup> CIDESD – Centro de investigação em Desporto, Saúde e Desenvolvimento Humano, Évora, Portugal

## Introduction

Low levels of physical activity (PA) in elderly has been related with the decline in physical and psychological functions, affecting the ability in the performance of activities of daily living (ADLs) and contributing to the occurrence of walking-related fall (Metz, Lee, Sui, Powell, Blair, 2010). The purpose of this study was to relate strength levels with fear of fall (FF), falls occurrence as well as with PA level on elderly women.

## Methods

One hundred not institutionalized post-menopausal women (aged  $66.17 \pm 8.21$  years) volunteered to participate on this research. The peak torque (PT) at  $60^\circ.s^{-1}$  (3 rep) and  $180^\circ.s^{-1}$  (20 rep) angular speeds in knee extension and flexion concentric actions were measured using an isokinetic dynamometer (Biodex System 3). Muscular fatigue was also estimated at  $180^\circ.s^{-1}$ . To achieve the occurrence of falls during last year as well FF score, we applied a standardized Questionnaire that included socio-demographic, health and falls parameters. PA level was accessed by interview with Yale Physical Activity Questionnaire.

Descriptive statistics was performed using means and standard deviations. The Spearman correlation coefficient was used to investigate associations among quantitative independent variables.

## Results

PT at  $60^\circ.s^{-1}$  in knee extension and flexion and PT at  $180^\circ.s^{-1}$  in knee flexion showed a positive association with vigorous index ( $r=,205$   $p=,041$ ;  $r=,249$   $p=,013$ ;  $r=,218$   $p=,029$  respectively). Standing index presented also a positive correlation with PT at  $60^\circ.s^{-1}$  and PT  $180^\circ.s^{-1}$  in knee extension ( $r=,205$   $p=,041$  and  $r=,314$   $p=,004$ ). FF registered a positive association with body mass (BM) and body mass index (BMI) ( $r=,205$   $p=,041$  and  $r=,201$   $p=,045$ ), and a negative association with PT in extension action on both angular velocities ( $r=-,241$   $p=,016$  and  $r=-,203$   $p=,043$ ). Muscular fatigue showed a positive correlation with the number of falls during the last year ( $r=,201$   $p=,036$ ).

## Conclusions

Decreases of strength on lower limb is an important factor that contributes to falls occurrence once we registered a negative relation between PT on extension action and the FF.

Our data related higher values of BM and BMI with higher fear of falling confirming that overweight are common associated to disturb on gait function and mobility that represents also a risk factor for falls.

Present results suggest that more time of PA is needed to increase lower limb strength in the elderly.

## References

Metz KJ, Lee DC, Sui X, Powell KE, Blair SN (2010) Falls among adults: the association of cardiorespiratory fitness and physical activity with walking-related falls. American Journal of Preventive Medicine 39(1):15-24

**Keywords:** Elderly women; Isokinetics strength; Fear fall; Physical activity level.

# 51. EFEITO DAS ATIVIDADES DE ENRIQUECIMENTO EXTRACURRICULAR (AEC) NA APTIDÃO FÍSICA DE CRIANÇAS PRÉ-PUBERTÁRIAS: UM ESTUDO PILOTO

Carlos Marta <sup>1,2</sup>, Natalina Casanova <sup>1,2</sup>, Jorge Casanova <sup>1,2</sup>, Teresa Fonseca <sup>1,2</sup>, Carolina Vila-Chã <sup>1,2,3</sup>, Nuno Serra <sup>1,2</sup>, Bernardete Jorge <sup>1,2</sup>, António Dias <sup>1,2</sup>, Carlos Francisco <sup>1,2</sup>, Mário Costa <sup>1,2,3</sup>, Carlos Sacadura<sup>1</sup>, Pedro Tiago Esteves <sup>1,2,3</sup>

<sup>1</sup> Instituto Politécnico da Guarda (IPG), Guarda, Portugal

<sup>2</sup> Unidade de Investigação para o Desenvolvimento do Interior (UDI), Portugal

<sup>3</sup> Research Center in Sports Sciences, Health and Human Development (CIDESD), Portugal

## Introdução

Existem evidências que os níveis de aptidão física e atividade física em crianças e jovens diminuíram acentuadamente em todo o mundo nas últimas décadas. Em Portugal, as Atividades de Enriquecimento Extracurricular (AEC) foram implementadas praticamente em todo o território nacional como uma solução pouco dispendiosa para um período de tempo que antes era assegurado por centros de Atividades de Tempos Livres (ATL). Assim, parece-nos de todo pertinente aferir da eficácia da implementação das AEC, no âmbito da atividade física e desportiva, sobre a aptidão física das crianças do 1º ciclo do ensino básico, num quadro societário marcado por níveis de sedentarismo preocupantes. O propósito deste estudo foi analisar o efeito AEC na aptidão física de crianças pré-pubertárias.

## Métodos

A amostra foi constituída por dois grupos experimentais, 123 crianças com vivências de AEC e 57 sem vivências de AEC, totalizando 180 indivíduos de ambos os géneros (10.04 ± 0.24 anos). A avaliação da aptidão física contemplou testes de capacidade aeróbia, força, resistência muscular, flexibilidade, velocidade, agilidade e equilíbrio.

## Resultados

Os indivíduos com vivência de AEC demonstraram superioridade na generalidade dos parâmetros analisados, exceto no equilíbrio. Registaram-se diferenças significativas entre grupos na força isométrica e força explosiva, velocidade e agilidade. O efeito das AEC foi maior na força explosiva dos membros superiores e menor no equilíbrio.

## Conclusão

Estes dados poderão contribuir para uma melhor planificação e desenvolvimento das AEC, no âmbito da atividade física e desportiva, no 1º CEB.

**Keywords:** literacia motora; educação físico-motora; infância; performance.

## 56. EFECTOS DEL ENTRENAMIENTO INTERVÁLICO DE ALTA INTENSIDAD SOBRE LA COMPOSICIÓN CORPORAL DE PREADOLESCENTES

Alba Camacho Cardenosa<sup>1</sup>, Marta Camacho Cardenosa<sup>1</sup>, Marta Marcos Serrano<sup>1</sup>, Ismael Martínez Guardado<sup>1</sup>, Guillermo Olcina Camacho<sup>1</sup> and Javier Brazo Sayavera<sup>1</sup>

<sup>1</sup> Universidad de Extremadura, Spain

### Introducción

La obesidad o acumulación excesiva de grasa en el cuerpo, es el principal problema de salud en la infancia en países desarrollados. Es de vital importancia el estudio de esta patología pues está considerada el quinto factor de riesgo de defunción en el mundo. Numerosos estudios establecen que el entrenamiento interválico de alta intensidad (HIIT) es un método eficaz para reducir la grasa corporal. El objetivo del trabajo es conocer el efecto del entrenamiento interválico de alta intensidad sobre parámetros de la composición corporal en comparación con el entrenamiento continuo en preadolescentes.

### Métodos

35 sujetos de un colegio de Cáceres fueron divididos en dos grupos: uno de ellos realizó un programa de 8 semanas de HIIT mientras que el otro llevó a cabo otro programa de la misma duración pero aeróbico continuo (CON) (65-75% FCmax). La progresión de trabajo del grupo HIIT fue de 4 a 6 series y una relación esfuerzo: recuperación de 1:3 a 1:1. Se llevaron a cabo mediciones pre y post tratamiento de parámetros de composición corporal: % masa grasa en el tronco, % masa grasa y magra en la pierna derecha, % masa grasa y magra en la pierna izquierda, mediante biomedancia con una báscula TANITA (BC 418 Massegmental, Biológica Tecnología Médica S.L, Barcelona, España). Mediante una prueba ANOVA de medidas repetidas se establecieron las diferencias intra e inter sujetos y la *d* de Cohen para determinar el tamaño del efecto.

### Resultados

El grupo CON presentó diferencias estadísticamente significativas intra sujeto con un tamaño del efecto moderado ( $p=0,04$ ;  $TE=0,31$ ) en el porcentaje de masa grasa del tronco. En los parámetros relacionados con la masa grasa y magra en las piernas no se observaron diferencias estadísticamente significativas en el análisis intra sujeto en ninguno de los grupos. Sin embargo, en el grupo HIIT el tamaño del efecto es mayor en el porcentaje de masa grasa en las piernas que en el grupo CON. No se observaron diferencias estadísticamente significativas en el análisis inter sujeto en ninguna de las variables estudiadas.

### Conclusiones

El entrenamiento interválico de alta intensidad aplicado durante 8 semanas produce un tamaño del efecto mayor en el porcentaje de masa grasa de las piernas que el entrenamiento continuo en preadolescentes. El tamaño del efecto encontrado indica la necesidad de continuar estudiando las diferencias entre ambos programas de entrenamiento.

### Referencias

Boutcher, S. H. (2011). High-intensity intermittent exercise and fat loss. *J Obes*, 2011, 868305. doi: 10.1155/2011/868305.  
Buchan, D. S., Ollis, S., Young, J. D., Cooper, S. M., Shield, J. P., & Baker, J. S. (2013). High intensity interval running enhances measures of physical fitness but not metabolic measures of cardiovascular disease risk in healthy adolescents. *BMC Public Health*, 13, 498. doi: 10.1186/1471-2458-13-498.

**Keywords:** interval training; obesity; fat mass.

# 57. DISEÑO DE UN PROGRAMA DE INTERVENCIÓN FÍSICA E INTERVENCIÓN PSICOLÓGICA EN PACIENTES CON CÁNCER DE MAMA METASTÁSICO

Matilde Mora Fernández<sup>1</sup>, Raquel Calero Domínguez<sup>2</sup> and María Valero Arbizu<sup>3</sup>

<sup>1</sup>Faculty of Educational Sciences, Department Physical Education and Sports, University of Seville, Spain

<sup>2</sup>Group Oncoavanza, Hospital Nysa and Center of health Mapfre Seville, Spain

<sup>3</sup>Group Oncoavanza. Hospital Sagrado Corazón, Seville, Spain

## Introducción

Recibir un diagnóstico de cáncer y convivir con él conlleva sufrir un “desajuste emocional”. El cáncer de mama es el más frecuente entre las mujeres españolas, la incidencia de este tumor ha aumentado en las dos últimas décadas. Cada año más pacientes sobreviven a un cáncer y se incrementa la demanda de nuevas necesidades de atención a este colectivo.

Los síntomas físicos como la astenia o fatiga, el dolor y linfedema generan un impacto negativo sobre la salud de las pacientes y producen malestar emocional. Realizar actividad física regular disminuye en un 38% el riesgo de padecer cáncer de mama y en pacientes con la enfermedad, el ejercicio físico incrementa la supervivencia cuando la curación no es posible mejorando la calidad de vida.

El trabajo en el medio acuático para pacientes supervivientes de cáncer de mama es fundamental ya que disminuye el estrés del peso en las articulaciones, huesos y músculos, reduciendo el dolor. Además puede reducir la depresión, ansiedad y mejorar el estado de ánimo, mostrando mejoras en el estado psicológico del paciente, Cuesta, Buchand & Arroyo M (2014); Cantarero et als. (2013).

## Método

Se establecerán 2 grupos: control y experimental. Con el grupo experimental, se pretende confirmar la eficacia de un programa de 12 semanas de entrenamiento combinando actividad física e intervención psicológica en pacientes con cáncer de mama metastásico. Para ello se desarrollarán ejercicios de carácter aeróbico en el medio acuático (deep water running) y fortalecimiento muscular con bandas elásticas, combinándolo con sesiones de intervención psicoterapéutica.

## Resultados

Medición de variables antes de comenzar y al finalizar el programa de intervención de: capacidad funcional (escala de Borg, test de flexibilidad, capacidad aeróbica y fuerza), ansiedad y depresión (escala HAD), imagen corporal (escala BIS) y calidad de vida de los participantes (escala QLQ-C30 y QLQ-BR-23).

## Conclusiones

Evidenciar los efectos positivos sobre la salud y calidad de vida de mujeres con cáncer de mama metastásico, tras un programa combinado de actividad física en el medio acuático y de intervención psicológica.

## Referencias

Cantarero I., Fernández C., Cuesta Al., Del Moral R., Fernández C. & Arroyo M. (2013) The effectiveness of a Deep Water aquatic exercise Program in cancer-related fatigue in breast cancer Survivors: A Randomized Controlled Trial. Archives of Physical Medicine and Rehabilitation 94, 221-30

Cuesta Al., Buchand J., Arroyo M. (2014). A multimodal physiotherapy programme plus deep water running for improving cancer-related fatigue and quality of life in breast cancer survivors. European journal of cancer care 23, 15-21.

**Keywords:** Cáncer de mama metastásico; Deep water running; Mindfulness; Psicooncología.

## 64. A MULHER OBESA E A PRÁTICA DESPORTIVA APÓS CIRURGIA POR OBESIDADE

Clara Estima<sup>1</sup>  
Nuno Corte Real<sup>2</sup>

<sup>1</sup>Hospital da Prelada, Porto, Portugal

<sup>2</sup>Faculdade de Desporto da Universidade do Porto, Portugal

### Introdução

A obesidade é uma situação clínica crónica que requer cuidados de saúde continuados. A prática desportiva é considerada uma componente essencial para a manutenção de um estilo de vida saudável e tida como auxiliar útil e eficaz para a perda de peso, nomeadamente em casos de pessoas obesas submetidas a cirurgia por obesidade.

### Metodologia

A fim de avaliar qual a intenção de prática desportiva em mulheres adultas obesas em fase pós-cirúrgica, realizámos um estudo num âmbito multidisciplinar em contexto hospitalar, em 186 mulheres adultas que colocaram uma banda gástrica. Estas foram avaliadas numa primeira consulta de psicologia após a cirurgia e caracterizadas nas suas componentes sociodemográficas tendo sido utilizado o modelo transteórico segundo os seus estádios: pré-contemplação; contemplação; preparação; ação; e manutenção. Foram também avaliadas as barreiras face à prática desportiva.

### Resultados

A idade média das participantes era de 40,89 anos e clinicamente foi avaliado o Índice de Massa Corporal (IMC) antes (M=43,31; DP=5,938) e depois da cirurgia (M=38,71; DP=6,282), com um intervalo médio para a primeira consulta de psicologia após cirurgia de 5,72 meses. A maioria (59,2%) não incluía qualquer prática desportiva na sua vida diária e apenas 26,9% se encontravam no estádio de ação e 14% no de manutenção com prática desportiva regular. Das barreiras à prática desportiva é de referir como as mais frequentes a falta de motivação (41,9%) ou de tempo (32,8%) e a doença (19,9%).

### Conclusões

O facto dos níveis de prática desportiva terem sido baixos mostra-se preocupante. Urge criar condições e adotar medidas continuadas capazes de esclarecer e de motivar regularmente estas mulheres adultas em processos de emagrecimento, de acordo com a fase de mudança em que estão incluídas ultrapassando barreiras, no sentido da adoção de um estilo de vida mais saudável que inclua a prática desportiva regular.

### Referências

- Jacobi, D., Ciangura, C., Couet, C., & Oppert J.M. (2010). Physical activity and weight loss following bariatric surgery. *International Association for the Study of Obesity*, 12, 366-377.
- King, W.C., & Bond, D.S. (2012). The Importance of Preoperative and Postoperative Physical Activity Counseling in Bariatric Surgery. *American College of Sports Medicine*, 41(1), 26-35.

**Keywords:** obesidade; cirurgia; mulher; prática desportiva.

# 74. OS EFEITOS DA ATIVIDADE FÍSICA DIÁRIA NA APTIDÃO FUNCIONAL, FORÇA E COMPOSIÇÃO CORPORAL DE IDOSAS DA COMUNIDADE DE BRAGANÇA

Monteiro, AM <sup>(1)</sup>; Carvalho, J. <sup>(2)</sup>

<sup>(1)</sup> Instituto Politécnico de Bragança, CIDESD, Portugal

<sup>(2)</sup> Faculdade de Desporto da Universidade do Porto, CIAFEL, Portugal

## Objetivo

Avaliar a contribuição relativa da atividade física (AF) diária objetivamente estimada, na aptidão funcional, força isocinética e composição corporal de idosas da comunidade de Bragança.

## Material e Métodos

A amostra inicial foi constituída por 80 idosas voluntárias com idades compreendidas entre os 60 e os 85 anos ( $67,69 \pm 5,30$ ). A avaliação da atividade física habitual foi feita utilizando acelerómetros uniaxiais modelo GT1M *Actigraph* durante 7 dias tendo sido utilizados os pontes de corte de *Coopeland* para calcular os diferentes tercis de atividade física (1º tercil,  $\leq 507,75$  counts; 2º tercil,  $507,75 - 752,08$  counts; 3º tercil,  $\geq 752,08$  counts). A avaliação e quantificação da composição corporal (CC) (massa magra corporal total - MM kg; a percentagem de massa gorda - %MG e a massa gorda corporal total - MGT kg) foi efetuada através de um scan corporal total com o equipamento DXA (Hologic QDR - 4500®). O IMC, expresso em kg/m<sup>2</sup> foi calculado através da fórmula *standard* [peso (kg) dividido pela altura<sup>2</sup> (m)]. A avaliação da aptidão funcional (ApF) foi realizada utilizando a bateria de testes *Functional Fitness Test*. A força isocinética dos músculos extensores e flexores do joelho foi avaliada em ambos os membros inferiores, através de um dinamómetro (Biodex System 2, NY, USA) em duas velocidades distintas: 60º/seg. e 180º/seg. O *one-way* ANOVA foi utilizado, tendo como post hoc o teste de *Bonferroni* para comparar as diferenças entre grupos. O nível de significância estatística foi mantido em  $p < 0,05$ .

## Resultados

No que respeita à CC, verificou-se que o 3º tercil apresentou um IMC ( $p=0,014$ ) e %MG ( $p=0,029$ ) significativamente mais baixo do que o 2º tercil. Na variável flexão do joelho a 180º/seg na perna dominante ( $p=0,051$ ) e na perna não dominante ( $p=0,020$ ) foram observadas diferenças significativas entre o grupo das menos ativas (1º tercil) e o grupo das mais ativas (3º tercil). Relativamente à ApF, não foram encontradas diferenças estatisticamente significativas entre os grupos. Os nossos resultados sugerem assim que exercício diário parece ter influencia positiva na alteração do IMC e %MG, bem como, nos níveis de força isocinética do movimento de flexão do joelho, não tendo contudo, um papel significativo na funcionalidade geral de mulheres idosas independentes e residentes na comunidade.

## Referências

Carvalho, J., Marques, E., Soares, J. M., & Mota, J. (2010). Isokinetic strength benefits after 24 weeks of multicomponent exercise training and a combined exercise training in older adults. *Aging Clin Exp Res*.  
Copeland, J. L., & Eslinger, D. W. (2009). Accelerometer assessment of physical activity in active, healthy older adults. *J Aging Phys Act*, 17(1), 17-30.

**Keywords:** Atividade física diária; Terceira idade; Aptidão Funcional; Força isocinética.

# 79. EFFECTS OF A PHYSICAL FITNESS PROGRAM IN THE FUNCTIONAL AUTONOMY AND SATISFACTION WITH LIFE ON ELDERLY MEN

Guilherme Furtado<sup>1</sup>, Rubens Letireri<sup>2</sup>, Mateus Ulba<sup>1</sup>, Humberto Carvalho<sup>3</sup>, José Pedro Ferreira<sup>3</sup> and Estélio Dantas<sup>4</sup>

<sup>1</sup>FCDEF-UC - CAPES/BRASIL, Portugal

<sup>2</sup>Universidade Regional do Cariri - Iguatu/CE, Brazil

<sup>3</sup>CIDAF/FCDEF-UC, Portugal

<sup>4</sup>LABIMH, Brazil

## Introduction

The scientific evidence corroborates that decreased levels of physical activity in elderly person is associated with a reduction of quality of life, which includes aspects of physical health and psychological well-being. This study aimed to examine the effects of a combined Physical Fitness Training (CFT) on functional autonomy and satisfaction with life (SWL) in elderly men's.

## Methods

The sample consisted of male participants from two elderly care institutions. The participants were divided into an intervention group (ITGP; n = 32; age = 78.5 ± 3.5 years) and of them underwent a CFT program lasting 12-weeks and often twice weekly, and 32 of them formed the control group (CG; N= 29; age 75.0 ± 5.1 years). To measure of the PWB dimension was used Brazilian version of the Satisfaction with life scale (SWLS). The FA was analyzing through the protocol of the Latin American Development Group (LAGED) developed by Dantas & Vale (2004). Descriptive statistics are presented as mean ± standard deviation for FA, SWL, age, and body mass index (BMI) indicators for the both groups. The tests were applied before-after the 12-weeks of exercise intervention in both groups. Participants in the CG did not undergo the passage through exercise program. All dependent variables were log-transformed before analysis to reduce non-uniformity of error and to express effects as percent changes, except SWL indicator were based on Likert scales. The paired-t statistics (expressed effects as percent changes) revealed significant reductions in the execution time of all the tests of the GDLM indicated possible benefits that are intervention.

## Results

The trend of changes in body size as consequence of training seems to be possibly beneficial in all the functional autonomy indicators. As for the PWB dimension, there were significant differences for SWL, with the magnitude of the effect size suggesting that changes were Benefit possible.

## Conclusion

The present study demonstrates that a twelve-month CFT can improve FA and SWL perception in older men, pointing to evidence of possible benefits to physical and psychological health of these participants that may be associated.

## References

- Dantas, EH; VALE, RG. (2004) Protocolo GDLM de avaliação da autonomia funcional. *Fitness & Performance Journal*, 3(3), 169-180.  
Albuquerque, A.S. e Tróccoli, B.T. (2004). *Psicologia: Teoria e Pesquisa*, Brasília, Mai-Ago; Vol. 20 n. 2, pp. 153-164.

**Keywords:** Functional autonomy; satisfaction with life; exercise.

# 81. A ATIVIDADE FÍSICA COMO INDICADOR DE RISCO DA PERIODONTITE. REVISÃO NARRATIVA

Nuno Serra <sup>1</sup>, Elsa Domingues <sup>2</sup>

<sup>1</sup> Instituto Politécnico da Guarda (IPG), Guarda, Portugal

<sup>2</sup> Faculdade de Medicina Dentária da Universidade de Lisboa, Leiria, Portugal

## Introdução

A periodontite é uma patologia multifatorial, caracterizada por uma inflamação crônica, causada por bactérias periodontopatógenas que destroem as defesas do sistema imunitário, e afetam os tecidos de suporte dos dentes. As suas características são influenciadas por variadas condições, relacionadas com o indivíduo, fatores comportamentais e sociais, sistémicos, genéticos, entre outros. Estudos recentes têm relatado uma associação entre a atividade física e/ou aptidão física e a periodontite. O objetivo desta comunicação é analisar a influência da atividade física na doença periodontal e rever, de forma crítica, as referências internacionais sobre o tema.

## Metodologia

Pesquisa na base de dados *Pubmed* de estudos em inglês ou português, observacionais ou experimentais, que avaliem a influência da atividade física na periodontite, de 1995 a 2014, utilizando como palavras-chave, em língua inglesa: “*physical activity, fitness, body weight, periodontal disease, periodontitis, inflammation*”.

## Resultados

Os estudos analisados sugerem uma maior perda de inserção periodontal entre indivíduos com baixo nível de atividade física.

## Conclusão

Devido a existência limitada de estudos longitudinais, é difícil considerar a atividade física como um fator de risco para a doença periodontal. Os mecanismos biológicos que ligam estas duas condições ainda não são claros sendo necessários mais estudos que determinem o papel da atividade física no desenvolvimento da doença periodontal.

## Referências

- Al-Zahrani, M. S., Borawski, E. A. Bissada, N. F. (2005). Increased physical activity reduces prevalence of periodontitis. *Journal of Dentistry*, 33(9), 703-10.
- Al-Zahrani, M. S.; Borawski, E. A.; Bissada, N. F. (2005). Periodontitis and three health-enhancing behaviors: maintaining normal weight, engaging in recommended level of exercise, and consuming a high-quality diet. *Journal of Periodontology*, 76(8), 1362-1366.
- Merchant, A.T., Pitiphat, W., Rimm, E.B., Joshipura, K. (2003). Increased physical activity decreases periodontitis risk in men. *European Journal of Epidemiology*.18, 891–8.
- Shimazaki, Y., Egami, Y., Matsubara, T., Koike, G., Akifusa S., Jingu, S., Yamashita, Y. (2010). Relationship between obesity and physical fitness and periodontitis. *Journal of Periodontology*, 81(8), 1124-31.

**Keywords:** periodontite; atividade física; aptidão física.



## 82. PLAYING SPORTS OUT OF THE SCHOOL: AN INTERVENTION STUDY WITH THREE PUPILS WITH EXCESSIVE WEIGHT

André Leitão<sup>1</sup> and Susana Soares<sup>1</sup>

<sup>1</sup> *Faculdade de Desporto da Universidade do Porto*

### **Introduction**

The present study sought to examine the effect of an exercise program on the motivation for out of school exercise

### **Methods**

Two overweight (BMI = 26.66 and 29.65 kg m<sup>-2</sup>) and one obese pupil (BMI = 33.99 kg m<sup>-2</sup>) were identified within a class of 18 11th grade pupils. These students were subjected in two moments using semi-structured interviews (before and after the application of a physical exercise program to increase their motivation to practice), which aimed to determine the perceived barriers to the practice and its context within the Transtheoretical model of Glanz et al. (2008). The suggested physical exercise program was based on the training program recommended by Klika & Jordan (2013), which includes exercises in which the student uses his body weight and ordinary objects of everyday life just to promote and increase their daily practice level. The program was characterized by a circuit of exercises, consisting of 12 stations, with a runtime and rest of 30 seconds and a recommended intensity between moderate and vigorous, resulting in a total time of 10 minutes of exercise (Klika & Jordan, 2013).

### **Results**

The main barriers to practice were idleness, lack of provision, the accumulation of fatigue, school hours, video games, social networks and the absence of specific facilities.

### **Conclusion**

It was concluded that the exercise program was not effective, since the students admitted to not have fully complied with it. The obese subject progressed to the contemplation stage of the Transtheoretical Model, although this change meant only the intentions level, once the quantity of actual practice did not changed.

### **References**

- Glanz K., Rimer B. K., Viswanath K. Theory, research and practice in health behavior and health education. In: Glanz K., Rimer B. K., Viswanath K., editors. Health Behavior and Health education: Theory, Research, and Practice. 4th edition. San Francisco: Jossey-Bass; 2008. p. 23-40.
- Klika, B, Jordan, C. High-Intensity Circuit Training Using Body Weight: Maximum Results with Minimal Investment. Health & Fitness Journal. 2013; 17:3

**Keywords:** obesity; physical activity; school; motivation; intervention.

## 86. IS IT POSSIBLE TO DEVELOP PUPIL'S STRENGTH DURING PHYSICAL EDUCATION CLASSES?

Joana Reis<sup>1</sup>, André Leitão<sup>1</sup> and Susana Soares<sup>1</sup>

<sup>1</sup> *Faculdade de Desporto da Universidade do Porto*

### **Introduction**

The purpose of the present study was to analyze the effect of a strength training program, applied during physical education classes, on the development of the upper limbs, lower limbs and abdominal strength.

### **Methods**

Subjects were 36 pupils of both genders separated into two groups. The program consisted of a circuit with 8 exercises and it was applied at the beginning of the main part of the Physical Education class, during 6 weeks, with a frequency of 3 sessions per week. One group (16 students) performed the strength training program with additional load and the other (20 students) performed the same program with no additional load.

### **Results**

The results showed an increase in the strength of the upper limbs, but suggested a conditional use of additional load, once it not always induced higher additions in strength.

### **Conclusion**

In conclusion, to develop pupil's strength during physical education classes using short duration programs based in body weight only is possible.

**Keywords:** physical education; strength training; additional load.

# 87. EXERCÍCIO FÍSICO E APTIDÃO FÍSICA-FUNCIONAL EM IDOSOS: UM ESTUDO COM PARTICIPANTES DO PROGRAMA ATIVIDADE SÉNIOR EM VISEU

Abel Figueiredo<sup>1,2,3</sup> and Ermelinda Afonso<sup>1</sup>

<sup>1</sup>Instituto Politécnico de Viseu, Portugal (2) <sup>2</sup>CI&DETS - Centro de Estudos em Educação, Tecnologias e Saúde, Portugal; (3) <sup>3</sup>CIDESD, Portugal

## Introdução

O Município de Viseu, em colaboração com a Escola Superior de Educação de Viseu, promove um programa de exercício físico baseado num Paradigma Biopsicossocial do envelhecimento, dando também relevância à aptidão física-funcional. Este conceito está relacionado com a autonomia na execução de tarefas de prática frequente e necessária a todos os indivíduos, como tarefas de cuidados pessoais e de adaptação ao meio em que se vive.<sup>1</sup> Focando esta conceção, foi objetivo aferir a influência deste programa na aptidão física-funcional, conceptualizada como a capacidade fisiológica e/ou física para executar atividades diárias de forma segura e autónoma, sem revelar fadiga.

## Métodos

O estudo consistiu na aplicação de um programa de exercício bissemanal (Atividade de Pavilhão e Hidroginástica) com duração de 9 meses a 270 idosos (67.90±5.60 anos), 30.4% homens e 69.6% mulheres. As sessões (50') foram organizadas por: i) período inicial de aquecimento; ii) parte principal - exercícios de estimulação da resistência aeróbia, da força dos principais grupos musculares e exercícios de agilidade e equilíbrio com estimulação coordenativa e labiríntica; e iii) retorno à calma. Para os momentos de avaliação da aptidão física-funcional (pré e pós treino) foi utilizada a bateria Senior Fitness Test<sup>4,5</sup> e para a avaliação do equilíbrio e mobilidade funcional relacionado ao risco de queda foram aplicados, respetivamente, o *Functional Reach Test* (FRT)<sup>2</sup> e o *Timed Get-Up and Go Test* (TUG)<sup>3</sup>. Para a análise estatística utilizou-se o SPSS (17.0) incluindo medidas descritivas e comparativas entre as duas avaliações utilizando o teste t independente para amostras emparelhadas (nível de significância de 5%).

## Resultados

Aferiu-se: i) melhores desempenhos nos testes de força de membros inferiores ( $p < 0.05$ ); superiores ( $p = 0.000$ ); agilidade, velocidade e equilíbrio ( $p > 0.05$ ); flexibilidade de membros inferiores ( $p = 0.000$ ); equilíbrio estático ( $p = 0.000$ ); e aptidão aeróbia ( $p < 0.05$ ); ii) e pior desempenho no teste de flexibilidade de membros superiores ( $p > 0.05$ ). Relativamente ao risco de queda verificámos que: iii) 99.6% dos idosos têm baixo risco, consoante o desempenho final do TUG, aumentando este valor comparativamente ao inicial (97.0% de baixo risco); iv) no desempenho final do FRT, 15.4% apresentam um elevado a moderado risco de queda e o número de idosos com baixo risco aumentou de 45.9% para 84.1%, com diminuição dos com moderado e elevado risco, respetivamente de 45.2% para 14.4% e de 6.7% para 1.1%.

## Conclusão

Os resultados deste estudo sugerem que o programa desenvolvido foi efetivo na melhoria da maioria dos parâmetros da aptidão física-funcional dos participantes. É necessário rever a sobrecarga específica para a componente de flexibilidade de membros superiores que não obteve melhorias após o programa de exercício

## Referências

- Botelho, A. (2005). A Funcionalidade dos Idosos. In C. Paúl, & A.M. Fonseca (Ed.), *Envelhecer em Portugal: Psicologia, saúde e prestação de cuidados* (111-135). Lisboa: Climepsi Editores.
- Rikli, R. & Jones. C. (2001). *Senior Fitness Test Manual*. Champaign: Human Kinetics.

**Keywords:** Idoso; Funcionalidade; Limitações.

## 89. A APTIDÃO FÍSICA DE IDOSOS INSTITUCIONALIZADOS E A PRÁTICA DE ATIVIDADE FÍSICA

Petrica, J.<sup>1,2</sup>, Paulo, R.<sup>1</sup>, Serrano, J.<sup>1,2</sup>, Faustino, A.<sup>1</sup>, Mendes, P.<sup>1</sup>, Taveira, D.<sup>1</sup>

<sup>1</sup> Instituto Politécnico de Castelo Branco, Portugal, <sup>2</sup> CI&DETS

### Introdução

A busca da melhoria da qualidade de vida do idoso, uma vez que o envelhecimento é comum a todo o ser humano, tem levado à procura de adoção de estilos de vida saudáveis, originando diversos programas de atividade física, a fim de retardar os efeitos do envelhecimento.

Com o presente estudo pretendia-se conhecer, da forma mais aprofundada possível, a aptidão física funcional dos idosos institucionalizados a frequentarem aulas de atividade física, verificando se as suas habilidades motoras básicas sofriam variações consoante o género, a faixa etária e frequência semanal da aula.

### Métodos

Amostra: A nossa amostra consistiu num grupo de 32 idosos, com mais de 65 anos, do distrito de Castelo Branco, dos quais 24 eram mulheres e 8 eram homens. Estes foram ainda divididos por duas faixas etárias, uma que compreendia os idosos dos 65 aos 75 anos e outra que englobou os idosos com mais de 75 anos. 16 destes idosos frequentavam um programa de Atividade Física 2 vezes por semana e os outros, um programa com frequência trissemanal. Programa: Ambos os programas tiveram a duração de 9 meses e dedicaram-se ao fortalecimento da musculatura e ao desenvolvimento da flexibilidade, mobilidade osteoarticular, equilíbrio estático e dinâmico, coordenação óculo-manual e óculo-pedal e ao relaxamento. Instrumento: Foi utilizada uma adaptação do *Fullerton Functional Fitness Test* (Rikli e Jones, 2001), particularmente as provas relativas à força superior, força inferior, flexibilidade superior, flexibilidade inferior e a agilidade. Este instrumento foi aplicado no início, sensivelmente a meio e no final do programa. Tratamento dos dados: Para o tratamento dos dados foi usado o teste de *Friedman* por recurso ao SPSS, utilizando o nível de significância de 0,05.

### Resultados

Em termos globais, a Força inferior, a Força superior e a agilidade melhoraram significativamente ao longo do programa, mantendo-se a Flexibilidade superior e inferior estáveis. No Género Feminino, apenas a Força inferior e a Agilidade melhorou significativamente, enquanto que no género masculino foi a Força superior. No que respeita aos escalões etários, no escalão entre os 65 e 75 anos, só a Força superior melhorou significativamente, enquanto nos maiores de 75 foi a Força superior e a Agilidade. Já quanto à frequência semanal, os idosos que usufruíram de um programa bissemanal só não melhoraram a Flexibilidade inferior enquanto que os que tinham um programa trissemanal apenas melhoraram significativamente a Agilidade.

### Conclusão

Com o presente estudo pudemos verificar que todas as capacidades vão diminuindo à medida que a idade aumenta, as idosas apresentaram melhores resultados que os idosos em todas as categorias do teste e estranhamente a frequência bissemanal revelou melhores resultados.

### Referências

Rikli, E.; Jones, J. (2001). *Senior Fitness Test Manual*. Human Kinetics, California State University, Fullerton

**Keywords:** Atividade Física; Gerontomotricidade; Aptidão Física.