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UCAM President's Welcome

ON behalf of the UCAM, it is my pleasure to welcome you to the NSCA IV International Conference, to be held in Murcia in June 2014.

The UCAM has committed for sports since our early beginning, giving a major role to the practice, research and teaching. In fact the University offers a wide range of programmes related physical activity and sport, including vocational training, undergraduate and postgraduate studies. Among our students there are many athletes who have choosen UCAM to complete their academic and personal development.

Within this predilection for the sport and a healthy lifestyle, UCAM joined National Strength and Conditioning Association for bringing together some outstanding and worldwide recognised professionals in sports sciences research, training and fitness. All this set in the environment of Murcia, an open and dynamic city with a privileged location in the Mediterranean coast, where the climate, people and culture we hope will make this conference an enriching event and an unforgettable experience.

Welcome to Spain, welcome to UCAM.

D. José Luis Mendoza Pérez
President of the Catholic University of Murcia (UCAM)

Congress Presidents' Welcome

THE NSCA's members have a common interest in the broad field of strength and conditioning and include a diverse group of professionals from the sport science, athletic, allied health, and fitness industries. Founded in 1978, a goal of the NSCA is to bridge the gap between science and application in strength and conditioning. The NSCA has an active voice in the communication of news and developments in the field of strength and conditioning to the general public and its members.

The conference will be a gathering of colleagues and friends. We invite you to this scientifically and socially rewarding, memorable and enjoyable experience.

We will see you in Murcia!

Steven J. Fleck & Pedro E. Alcaraz
Congress Presidents

IV NSCA International Conference 2014

Human Performance Development through Strength and Conditioning

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SCIENTIFIC PROGRAM

June 25 – Wednesday

15:30 – Registration Opening.

16:00 – NSCA CPT/CSCS Certification Exams.

17:00 – Satellites.

June 26 – Thursday

08:00 – Registration opening.

09:15 – Opening Ceremony.
- Excmo. Sr. D. José Luis Mendoza Pérez. *UCAM President*.
- Excmo. Sr. D. Steve J. Fleck. NSCA President. *Congress President*.
- Excmo. Sr. D. Alejandro Blanco Bravo. *COE President*.
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- Ilmo. Sr.D. David García-López. *NSCA Spain President*.
- Ilmo. Sr. D. Pedro E. Alcaraz. *Congress President. UCAM.*

10:00 – Opening Conference:
- *Nonlinear Periodization: from Theory to Practice.* Steven J. Fleck (*NSCA President, USA*).
- Chair: Robert Newton (*Edith Cowan University, AUS*).

11.00 – Coffee Break / Stands Opening.

11:15 – Posters Session.

11:45 – Oral Communications and Workshops:

Oral Communications
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Germán Vicente-Rodríguez (*University of Zaragoza, SPA*)
  Room: Temple
- Topic: *Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness*.
  Chair: Eliseo Iglesias (University of A Coruña, SPA)
  Room: Assembly Hall.
- Topic*: Strenght, Power And Speed Training & Resistance Training And Fitnees In Elderly*.
  Chair: Domenico Cherubini (UCAM University, SPA).
  Room: PAV. VIII

Workshops
- *Integrative neuromuscular training for children and adolescents.*
  by Avery Faigenbaum *(The College of New Jersey, USA).*
  Room: *USC 1*
- *Functional Training*
  by Juan R. Heredia *(IICEFS Director, SPA)*
  Room*: USC Court*

12:45 – Invited Presentations:
- *The Application of the Yo-Yo Intermittent Endurance Level 2 Test to Elite Soccer Populations*. Jens Bansgbo (University of Copenhagen, DEN).
  Chair: José A. López-Calbet (*University of Las Palmas, SPA*).
- *Human thermoregulation and the cardiovascular system.*
  José González-Alonso (*Brunel University, UK*).
  Chair: José A. López Calbet (*University of Las Palmas, SPA*).

14:00 – Lunch

16:00 – Oral Communications and Workshops:
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Martin Keller (*Brown University, USA*).
  Room: Temple.
- Topic: *Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness.*
  Chair: Francisco J. Vera-García (*Miguel Hernández University, SPA*).
  Room: Assembly Hall
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: Asunción Martínez (*UCAM University, SPA*)
  Room: PAV. VIII

Workshops
- Crosstraining.
  by Iván Gonzalo *(Polythecnic University of Madrid, SPA).*
  Room*: USC Court*.
- Posture Control Exercises.
  by Hector García *(KineSpai Center, SPA).*
  Room*: USC 2*.

17:15 – Invited Presentations:
- *Resistance training and functional capacity in physically frail older adults.* Mikel Izquierdo (*University of Navarra, SPA*).
  Chair: Per Aagaard (*University of Southern Denmark, DEN*).
- *Are training velocity and movement pattern important determinants of muscular rate of force development enhancement?*
  Anthony J. Blazevich (*Edith Cowan University, AUS*).
  Chair: Per Aagaard (*University of Southern Denmark, DEN*).

18:30 – Coffee Break.

19:00 – Oral Communications and Workshops:
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Ricardo Fernandes (*University of Porto, POR*).
  Room: Temple.
- Topic: *Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness.*
  Chair: José Luis Lopez-Elvira (*Miguel Hernández University, SPA*).
  Room: Assembly Hall.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: Alex González-Agüero (*Aberystwyth University, UK*).
  Room: PAV. VIII

Workshops
- Training with Kettlebells.
  by Leo Cavallo (*Kettlebells Barcelona, SPA*).
  Room: USC 1.
- New Trends in High Performance Conditioning.
  by Bill Foran (*Miami Heat, USA*).
  Room: USC Court.

June 27 – Friday

09:00 – Oral Communications and Workshops:
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Jorge Pérez-Gómez (*University of Extremadura, SPA).*
  Room: Temple.
- Topic: *Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness.*
  Chair: Benedikt Lauber. (*Albert Ludwig University, SWI*)
  Room: Assembly Hall.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: Antonio Paoli (*University of Padova, ITA*).
  Room: PAV. VIII.

Workshops
- New Trends in High Performance Conditioning.
  by Bill Foran (*Miami Heat, USA*).
  Room: USC Court.
- Posture Control Exercises.
  by Hector García (*KineSpai Center, SPA*).
  Room: USC 2.

10:00 – Plenary Session:
- *Anabolic Exercise for Cancer Management*. Robert U. Newton (*Edith Cowan University, AUS*).
  Chair: Roger Enoka (University of Colorado, USA).

11:00 – Coffee Break.

11.15 – Posters Session.

11:45 – Oral Communications and Workshops:
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Linda H. Chung (*UCAM University, SPA*).
  Room: Temple.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: David Casamichana (*University of País Vasco, SPA*).
  Room: Assembly Hall.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: Lorena Torres (*INEFC University, SPA*).
  Room: PAV. VIII

Workshops
- Crosstraining.
  by Iván Gonzalo *(Polytechnic University of Madrid, SPA).*
  Room*: USC Court.*
- Training with Kettlebells.
  by Leo Cavallo (*Kettlebells Barcelona, SPA*).
  Room: USC 1.

12:45 – Invited Presentations:
- *Hyper-activation of skeletal muscle stem cells with blood flow restricted strength training.* Per Aagaard (*University of Southern Denmark, DEN*).
  Chair: José González-Alonso (*Brunel University, UK*).
- *Altitude challenges for high-level athletes.* José A. López-Calbet (*University of Las Palmas, SPA*).
  Chair: José González Alonso.

14:00 – Lunch.

16:00 – Oral Communications and Workshops:
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Alba Gómez-Cabello (*University of Zaragoza, SPA*).
  Room: LMC-1.
- Topic: Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness.
  Chair: Raúl Arellano (*University Of Granada, SPA*).
  Room: LMC-2.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: Antonio Calderón (UCAM University, SPA).
  Room: LMC-3.

Workshops
- Integrative neuromuscular training for children and adolescents.
  by Avery Faigenbaum *(The College of New Jersey, USA).*
  Room: LMC Hall.
- Functional Training.
  by Juan R. Heredia *(IICEFS Director, SPA).*
  Room*:* USC Court.

17:15 – Invited Presentations:
- *Neural and structural adaptations to electrical stimulation strength training.* Nicola A. Maffiuletti (*University Schulthess Klinik, Zurich, SWI*).
  Chair: Anthony J. Blazevich (*Edith Cowan University, AUS*).
- *Repeated-Sprint ability: factors contributing to fatigue and recommendations for training.* Alberto Méndez-Villanueva (ASPIRE, QTR)
  Chair: Anthony J. Blazevich *(Edith Cowan University, AUS).*

18:30 – Coffee Break

19:00 – Oral Communications and Workshops:
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Julio Calleja (*University of País Vasco, SPA*).
  Room: LMC-1.
- Topic: Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness.
  Chair: Luis Alegre (*University of Castilla-La Mancha, SPA*).
  Room: LMC-2.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: Pedro Jiménez (UCAM University, SPA).
  Room: LMC-3.

Workshops
- Evaluation of Aquatic Performance through Strength Assessment.
  by Ricardo Fernandes (*University of Porto, POR*).
  Room: LMC Swimming Pool.
- Introduction to Olympic Lifts.
  By Lucio Doncel (*Olympic Lifter Coach, SPA*).
  Room: LMC GYM.

20:30 – Mediterranean Barbecue.

June 28 – Saturday

10.00 – Plenary Session:
- *Neuromuscular mechanisms that mediate the acute adjustments and chronic adaptations to strength training.* Roger M. Enoka (*University of Colorado, USA*).
  Chair: Robert U. Newton (*Edith Cowan University, AUS*).

11:00 – Coffee Break.

11.15 – Posters Session.

11:45 – Oral Communications: O.C.A. Finalists.
- Topic: *Exercise Physiology & Sport Nutrition and Ergogenic Aids*.
  Chair: Amelia Guadalupe-Grau (*University of Copenhagen, DEN*).
  Room: Temple.
- Topic: Biomechanics and Motion Analysis & Neuromuscular Basis of Strength and Fitness.
  Chair: Azael J. Herrero (*European University Miguel de Cervantes, SPA*).
  Room: Assembly Hall.
- Topic: Strength, Power and Speed Training & Resistance Training and Fitness in Elderly.
  Chair: David García-López (*European University Miguel de Cervantes, SPA*).
  Room: PAV. VIII.

12:45 – Closing Conference.
- *Revisiting the Strength/Endurance Continuum: A New Paradigm for Hypertrophy Training.* Brad Schoenfeld (*CUNY Lehman College, USA*).
  Chair: Steven J. Fleck (NSCA President, USA).

13:45 – Closing Ceremony.
- Excma. Sra. Dña. Josefina García Lozano. *UCAM Magnificent Rector*.
- Excmo. Sr. D. Steve J. Fleck. *Presidente de NSCA. Congress President*.
- Ilmo. Sr. D. Ricardo Leiva Román. *Sport Director. COE*.
- Ilmo. Sr. D. José Luis Mendoza García. *Director of Institutional Relations. UCAM*.
- Ilmo. Sr. D. Antonio Sánchez Pato. *Local Organizing Committee President. UCAM*.
- Ilmo. Sr. D. Azael J. Herrero. *NSCA Spain Vice-President*.
- Ilmo. Sr. D. Pedro E. Alcaraz. *Congress President. UCAM*.

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Conferences

NONLINEAR PERIODIZATION FROM THEORY TO PRACTICE

Steven J. Fleck

Associate Professor and Chair Health, Exercise Science and Sport Management
University of Wisconsin-Parkside, Kenosha, Wisconsin, U.S.A.

Periodization of weight training is the manipulation of acute training variables over time in an attempt to bring about optimal training adaptations. There are several types of weight training periodization that have been examined in the scientific literature. Linear periodization follows a pattern of increasing training intensity and decreasing training volume as training progresses. Planned changes in training volume and intensity can occur due to manipulating the weight lifted, number of repetitions performed per set and number of sets of each exercise performed. However, manipulation of training can also include changes in any of the acute training variables, including the choice of exercise performed, rest periods between sets and exercises, and the number of training sessions performed per week. Daily nonlinear periodization is a relatively new type of resistance training periodization and has gained popularity among athletes and fitness enthusiasts. Although there are several manners in which training intensity and volume can be manipulated with daily nonlinear periodization there are typically three training zones used that change on a training session by training session basis. Although any number of training zones could be performed typical training zones are 4-6, 8-10 and 12-15 repetitions per set. In most studies to date a total body weight training program has been performed three days per with each of the three training zones used one day per week. Additionally, although not examined in studies to date exercise choice, rest period length, number of training sessions per week and other acute training variables can be manipulated in a daily nonlinear periodization training model. Studies to date demonstrate daily nonlinear periodization can be safely performed in various populations, including children to seniors, and that it is effective in bringing about training adaptations in all of these populations. Studies have reported increased strength, increased lean body mass, positive effects on the blood lipid profile, and increased motor performance. This presentation will review the peer-reviewed studies in which daily nonlinear periodization has been used and the results shown. Additionally, how to implement a daily nonlinear periodization program will be discussed and described.

Conferences

RESISTANCE TRAINING AND FUNCTIONAL CAPACITY IN PHYSICALLY FRAIL OLDER ADULTS

Mikel Izquierdo

Department of Health Sciences. Public University of Navarra, Spain.

Frailty has been defined as an age-associated medical syndrome with multiple causes and contributors that is characterized by diminished strength, endurance, and reduced physiologic function that increases an individual's vulnerability for developing increased dependency and/or death. This syndrome is strongly associated with low muscle mass and puts older individuals at special risk for disability, hospitalization, and death due to falls and many other causes when exposed to a stressor. As a consequence of impaired muscle function, the diagnosis of frailty involves physical impairments, such as low gait speed, fatigue, and low grip strength (1-3). Poor health, disability, and dependency do not need to be the inevitable consequences of aging. Indeed, older adults who practice healthy lifestyles, avoid being sedentary, participate in physical exercise (e.g., walking, strength training, or self-adjusted physical activity), use clinical preventive services, and continue to engage with family and friends are more likely to remain healthy, live independently, and incur fewer health-related costs.Due to the physical domains related to frailty, physical activity is one of the most important components in the prevention and treatment of frailty. Indeed, the benefits of physical exercise in improving the functional capacity of frail, older adults have been the focus of considerable recent research (1-3). The positive effects of exercise on functional capacity may be observed more often when multiple physical conditioning components (i.e., strength, endurance, or balance) are included in the exercise intervention compared to only one type of exercise. The absence of changes in functional or strength outcomes measured in certain previous studies indicates that the exercise prescription must be carefully adapted to provide a sufficient stimulus for improving not only maximal strength but also the functional capacity and muscle power output performance of frail subjects. Therefore, multicomponent exercise interventions should be included in the routines of institutionalized oldest old as these interventions appear to be the most effective for improving overall physical outcomes among frail elderly as well as for preventing disability and other adverse outcomes (2-3).Furthermore, several previous studies have observed positive training-induced muscle power enhancement in ambulatory, community dwelling older adults with or without self-reported limitations in physical functioning. Based on these results, it was suggested that functional capacity among frail elderly adults could be improved by performing resistance training at a high speed of motion with a loading stimulus that optimizes muscle power output. Recently, it has been reported that 12 weeks of multicomponent exercise training including explosive resistance training improved muscle power output (96-116%), strength (24-144%), muscle cross-sectional area and muscle fat infiltration (4-8%), as well as functional outcomes and dual task performance (7-58%) in frail institutionalized nonagenarians (1). Interestingly, in another recent study, it has been shown that 4 weeks of high-speed resistance training combined with walking, cognitive and balance exercises improved the gait ability, balance, and muscle strength (15-30%), as well as reduced the incidence of falls in frail patients with dementia after long-term of physical restraint used in their nursing care (2). These novel results are especially relevant because it demonstrates that the exercise intervention including muscle power training may bring benefits even in frail patients with cognitive impairment at very poor physical condition. It should be mentioned that overall, these benefits were achieved only after the inclusion of the resistance training in the exercise intervention, because the walking, cognitive and balance exercises performed by 4 weeks previously the resistance training inclusion, only improved the balance performance.

Thus, routine multicomponent interventions that include muscle power training should be prescribed to institutionalized oldest old because such interventions improve the overall physical status of frail elderly individuals and prevent disability and other adverse outcomes. This result is especially important in frail subjects, who urgently need to improve their functional capacities to prevent adverse outcomes such as falls, hospitalizations, disability, or even death. Additionally, it should be highlighted that resistance exercise does not only help to reduce the risk and incidence of falls in seniors, but may also help to prevent injuries when these falls occur (1-3).

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ARE TRAINING VELOCITY AND MOVEMENT PATTERN IMPORTANT DETERMINANTS OF MUSCULAR RATE OF FORCE DEVELOPMENT ENHANCEMENT?

Blazevich, A.J.
Edith Cowan University, Perth, Australia.

In many sporting and daily living tasks the time available for force production is relativelyshort when compared to the time required to develop maximal muscle tension (>300 ms). Thus, successful task completion requires the rapid development of muscular (contractile) force, i.e. a fast rate of force development (RFD). The muscular rate of force development can be estimated during a maximal isometric muscle contraction, where the rate of force rise measured at a point on the skeleton depends on the rate of increase in muscle activityand the subsequent rate of tension rise within the muscle-tendon unit. This measurement is not synonymous with the rate of dynamic force development (RFDdyn), where forces are measured at a point on the skeleton during a dynamic movement and thus where the muscle's capacity to develop forces during fast muscle shortening and lengthening impact notably on the measured rate of force rise. In this presentation, the effects of training movement velocity and kinematic pattern on contractile (i.e. isometric) rate of force development will be examined with a view to (1) determining appropriate training strategies and (2) examining the requirements of future research.

Given the principle of training specificity, it could be hypothesised that the optimum stimulus for RFD enhancement involves the performance oftraining exercises at fast movement speeds, or at least with the intent to develop force as rapidly as possible. However, numerous studies have reported significant improvements in RFD after traditional, heavy-load (i.e. slower-velocity) or isometric strength training in muscle groups including the knee extensors, elbow flexors, plantarflexors,dorsiflexorsand trapezius, as well as in an isometric leg press. In such studies, the mean improvement in RFD was >40% (over periods of several weeks to months), and thus a reasonable conclusion is that fast movement speeds are not required for significant improvements in RFD to be attained. In fact, studies examining changes in RFD after 'explosive' strength training report more modest improvements (~10%), indicating that heavy (and slow) strength training may be a superior stimulus. Such a conclusion is contrary to current practice and suggests that an important and under-utilised strategy for improving RFD is to use heavy-resistance training exercises.

A reflection on the factors influencing RFD, including increases in muscle activation, peak contractile force and muscle-tendon stiffness, may provide some indication as to why such training is beneficial.

Nonetheless, the movement pattern (or body position) adopted during training appears to be an important factor influencing the influence of exercise training on RFD: much smaller increases in RFD are obtained after heavy strength training when the test movement pattern (or body position) is different from the training movement pattern. Moreover, when the testing and training tasks are kinematically similar, increases in RFD arestill commonly observed after higher-speed training or when isometric forces are attained rapidly during training. Such findings indicate that a complex interplay exists between training movement pattern and velocity and RFD enhancements, where heavier (slower) training may elicit greater increases in RFD when the training and testing movement patterns are similar but that a greater transfer of RFD improvements to dissimilar tasks may occur when higher-speed (lower load) training is performed. Nonetheless, despite the increase in the number of studies measuring RFD after periods of exercise training in recent years, further research incorporating both kinematically similar and dissimilar tasks is still required to more accurately determine the effects of movement pattern and velocity on RFD and its transfer to tasks with different movement patterns.

THE APPLICATION OF THE YO-YO INTERMITTENT TESTS TO ELITE SOCCER POPULATION

Jeans Bangsbo

Department of Exercise and Sport Sciences. Faculty of Sciences, University of Copenhagen. Denmark.

The Yo-Yo intermittent tests are probably the most used test in football, and it is clear that the higher the level of football the better the players perform in the tests. In both the Yo-Yo intermittent endurance and Yo-Yo intermittent recovery test maximal heart is reached demonstrating that the tests have a high aerobic component which is maintained over a long period in the Yo-Yo intermittent endurance test, whereas the anaerobic component is large in the Yo-Yo intermittent recovery test demonstrated by high rate of muscle lactate production.

For elite players the tests are carried out at the level 2. The tests are able to evaluate changes in performance for elite players. From the start to the end of the pre-season improvements of around 30% are seen for both tests, in contrast to change of less than 5% in the maximum oxygen uptake, illustrating that the Yo-Yo intermittent tests are sensitive to detect changes related to football performance. Also the effect of changes related to alterations in training volume and intensities have been evaluated with the tests.

Thus, Gunnarsson et al. (2012) found an 11%-increase in Yo-Yo intermittent recovery test performance when speed endurance training was added to the normal football training for 30 min every week for a 5-week period, and, similarly, Randers et al. (2007) found a 15%-increase in Yo-Yo intermittent recovery performance when during supplementary aerobic high intensity training for 30 min in a 8-week period in the middle of the season.

HUMAN THERMOREGULATION AND THE CARDIOVASCULAR SYSTEM

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A key but little understood function of the cardiovascular system is to exchange heat between the internal body tissues, organs and the skin to maintain internal temperature within a narrow range in a variety of conditions that produce vast changes in external (exogenous) and/or internal (endogenous) thermal loads. Heat transfer via the flowing blood (i.e. vascular convective heat transfer) is the most important heat-exchange pathway inside the body. This pathway is particularly important when metabolic heat production increases many-fold during exercise. During exercise typical of many recreational and Olympic events, heat is transferred from the heat-producing contracting muscles to the skin surrounding the exercising limbs and to the normally less mobile body trunk and head via the circulating blood. Strikingly, a significant amount of heat produced by the contracting muscles is liberated from the skin of the exercising limbs. The local and central mechanisms regulating tissue temperature in the exercising limbs, body trunk and head are essential to avoid the deleterious consequences on human performance of either hyperthermia or hypothermia.

This presentation will focus on recent literature addressing the following topics: (i) the dynamics of heat production in contracting skeletal muscle; (ii) the influence of exercise and environmental heat and cold stress on limb and systemic haemodynamics; and (iii) the impact of changes in muscle blood flow on heat exchange in human limbs. The presentation will highlight the need to investigate the responses and mechanisms of vascular convective heat exchange in exercising limbs to advance our understanding of local tissue temperature regulation during exercise and environmental stress.

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NEURAL ADAPTATIONS IN STRENGTH TRAINING: WHAT, WHY AND HOW?

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Although the force capacity of muscle is directly related to its cross-sectional area, it is possible to increase muscle strength in the absence of a change in muscle size. Such strength gains are attributed to changes in muscle activation caused by an intervention, such as a training program or aging. This presentation will consider three questions: what is the evidence that changes in muscle activation can increase muscle strength, why does modulation of muscle activation matter, and how are intended changes in muscle activation achieved? The evidence supporting a significant role for adaptations in muscle activation contributing to strength gains includes differences in the relative increases in muscle size and strength, the phenomenon of cross education, and the specificity of increases in muscle strength. The functional significance of changes in muscle activation can be demonstrated by both its association with declines in motor function with age and the gains that can be achieved with training. For example, a worsening of manual dexterity, as indicated by the time taken to complete a pegboard test, is evident in middle-aged adults whose hand strength does not differ from that of young adults and the strongest predictor of the variance in pegboard times is the steadiness of a submaximal isometric contraction. Moreover, training programs that emphasize steady contractions with submaximal loads can elicit increases in muscle strength and improvements in motor function in older adults. Similarly, speed training with moderate loads can increase motor unit discharge rate and the maximal rate of force development in young and old adults. These findings indicate that changes in the quality of muscle activation, as indicated by force steadiness and rate of force development, can impact both muscle strength and motor function. Of course, increases in the quantity of muscle activation can also contribute to strength gains. Despite this evidence, our understanding of the underlying adaptations remains rudimentary. The potential adaptations that could influence muscle activation include the level of voluntary activation, the responsiveness of spinal reflexes, and the amount of motor unit activity.

Although the neuronal adaptations associated with strength training seem to be more focused in the spinal cord than in the cerebral cortex, the early strength gains that occur when a person is learning new exercises likely involve the reorganization of cortical networks that encode various actions. Both spinal and cortical adaptations, however, can be manifested as an increase in the rates at which motor units discharge action potentials, which has been observed after training with ballistic contractions and with conventional heavy-load training programs. Nonetheless, the adaptations responsible for the changes in motor unit activity are largely unknown and potential directions for future research will be discussed. Understanding the neural adaptations that can be elicited by different conditions is critical to developing appropriate training interventions.

NEURAL AND STRUCTURAL ADAPTATIONS TO ELECTRICAL STIMULATION STRENGTH TRAINING

Nicola A. Maffiuletti

Director of the Neuromuscular Research Laboratory at the Schulthess Clinic in Zurich, Switzerland.

Neuromuscular electrical stimulation (NMES), which consists in the artificial activation of superficial skeletal muscles by means of intermittent stimuli, has received increasing attention in the last few years both as a strength training modality for healthy subjects and athletes (because its repeated use may induce neuromuscular adaptations that are complementary to voluntary strength training) and as a rehabilitation/preventive strategy for partially- or totally-immobilized patients (because its chronic application may preserve skeletal muscle mass and function during prolonged periods of reduced muscular use).

In this presentation I will describe the main physiological specificities of NMES exercise, in particular with respect to the muscle recruitment pattern, the acute physiological response and the time-course and mechanisms of adaptations induced by NMES (re)training in both healthy and patient populations. Special emphasis will be given to the acute and chronic changes in neural function that may occur with NMES, as they seem to mediate the majority of NMES training-induced adaptations. I will also illustrate some recent methodological advances that have the potential to favor a more physiological, efficient and effective utilization of NMES.

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TÉCNICO SUPERIOR EN ANIMACIÓN DE ACTIVIDADES FÍSICAS Y DEPORTIVAS

ANTONIO SÁNCHEZ PATO
Decano de la Facultad de Ciencias de la Actividad Física y del Deporte. Director de CFGS en Animación de actividades físicas y deportivas.

El ciclo formativo superior de Técnico superior en animación de actividades físicas y deportivas de la UCAM consiste en una formación dinámica para trabajar en el ámbito de las actividades físicas y deportivas. Estos estudios capacitan al alumno a dirigir y asesorar grupos o personas en el desarrollo de un gran número de actividades deportivas, físicas y recreativas dirigidas a diferentes colectivos. Están ligados a áreas de gran expansión profesional como el deporte recreativo, las actividades deportivas dirigidas y el turismo, dentro de espacios y organismos públicos y/o privados.

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Workshops

STRENGTH TRAINING FOR CHILDREN AND ADOLESCENTS

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Modern day youth are not as active as they should be and secular trends in muscle strength and motor skill performance highlight the need for youth coaches, physical education teachers and health care providers to integrate different types of strength-building exercises and skill-enhancing activities into class lessons and sports practice. Despite outdated concerns and misperceptions, a compelling body of evidence has found that pediatric resistance training can offer unique benefits for children and adolescents when appropriately prescribed and supervised. In addition to enhancing muscular strength and motor skill performance, regular participation in a youth resistance training program can facilitate weight control, strengthen bone and increase a young athletes' resistance to sports-related injuries. Furthermore, since good health habits established during childhood may carry over into adolescence and adulthood, the importance of implementing targeted interventions early in life should be recognized by teachers, coaches and health care providers. There is not one "optimal" combination of sets, repetitions, and exercises that will promote favorable adaptations in all children and adolescents. Rather, the sensible integration of different training methods and the periodic manipulation of program variables over time will keep the training stimulus effective, challenging and pleasurable for the participants. One example of an effective training concept is called *integrated neuromuscular training* or INT which incorporates both health-and skill-related components of physical fitness into every training session. This type of training does not require expensive equipment, but it does require qualified instruction, a systematic progression of training variables, and an understanding of pediatric exercise science. The goals of this workshop are to review the potential benefits of strength training for school-age youth, explain the rationale behind integrative neuromuscular training, and show attendees how to incorporate resistance training with medicine balls into a youth training program that is safe, effective and fun.

NEW TRENDS IN HIGH PERFORMANCE CONDITIONING

Bill Foran

MS, CSCS, RSCC*E. Head Strength and Conditioning Coach. Miami Heat.

This presentation will take an in depth look at the Miami Heat's strength and conditioning program. Coach Bill Foran will discuss his strength training philosophy based on total body balanced strength with an emphasis on the core and hips. The conditioning program is based on interval training to prepare players for the demands of a basketball game as well as the long NBA season. Quickness, agility, and explosiveness are also key components to preparing basketball players; reactive and resistance agility drills as well as plyometric and speed training complement the strength program for maximum results. Coach Foran will also discuss the importance of being at the proper body weight and body fat percentage and their effects on performance. We will take a look at new trends in training including the joint by joint approach, conditioning older athletes and injured athletes, and what is new in the NBA.

Oral

ECCENTRIC EXERCISE IN TREATMENT OF PATELLAR TENDINOPATHY IN HIGH LEVEL BASKETBALL PLAYERS. A RANDOMIZED CLINICAL TRIAL

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INTRODUCTION

Chronic patellar tendinopathy is a common pathology in sporting population. To date, there is no agreed upon protocol as election treatment (1, 2). Eccentric exercises have been used with satisfactory outcomes (3). The purpose of this trial is compare the effects of two eccentric exercise protocols.

METHODS

A prospective randomized clinical trial was constructed with a one month follow-up. Six high level basketball players (8 tendons) were recruited and randomized to one of two treatment groups (G1=4; G2=4). Pain and function were evaluated through EVA and VISA-P questionnaires before, during, and after the treatment. Group A: Based on Durham's protocol (4), it consisted of 3 sets of 15 repetitions, using no added weight, of half squats on a 25º declined platform, 2 times per day, 7 days per week. Group B: Consisted of 4 sets of 6 repetitions with 100% of 1MR for one leg, 3 days per week, in non-consecutive days, in leg extension machine. Both protocols were done with no restriction of competition.

RESULTS

After 4 weeks the outcomes showed that, despite improvement in both groups, none of the protocols reported a significant improvement in VAS or VISA-P. When analyzing the outcomes for VAS, in Group A the values decreased below baseline. Regarding the VISA-P values, Group A improved strength and function when pain perception decreased. In group B values kept a sustained growth. Comparing both protocols, no significant differences are noted in VAS values ($Z= 1,01$; $p>0,05$) or VISA-P ($Z=0,20$;$p>0,05$).

DISCUSSION

Most of studies used Durham´s protocol (4) combined with restriction of competition, with satisfactory results. We propose another eccentric protocol that includes overload training, to improve strength, and no restriction of competition. After 4 weeks of eccentric exercise protocol most of tendons in both groups improve function during treatment but does not significantly. Despite no significant difference we propose managing the tendinopathy with eccentric exercises during the competitive season to avoid deterioration.

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Oral

STAPHYLOCOCCUS AUREUS OUTBREAK ASSOCIATED WITH NASAL CARRIERS AND PERSPIRATION AMONG RUGBY PLAYERS

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INTRODUCTION

Staphylococcus aureus (*SA*) causes wound infection [1] and it is transmitted during physical contact sports [2]. An outbreak of *SA* occurred among a college rugby team infected 14 players. The infection rate was higher among forward, than back players (28% vs. 7%). We conducted a nasal-swab survey of 70 rugby football players after *SA* outbreaks, and found that 17% (12/70) were persistent nasal carriers. To better understand *SA* dissemination during physical contact sports, we compared the appearance of skin surface *SA* between nasal *SA* carriers and non-carriers before and after exercise.

METHODS

The skin of 16 healthy adult males (age, 20.1 ± 1.3 y) was swabbed before and after bicycle exercise for 15 min. Skin surface swabs were undertaken pre and post bicycle exercise. Placed swabs in PBS, and promptly delivering them to the laboratory. An aliquot was plated onto paired mannitol Compact Dry X-SA (CD-XSA; Nissui Pharmaceutical)[3]. Each sample were cultured on CD-XSA for 24h at 37°C, Afterincubation, *SA*grewon as blue colonies on the media. Total colony-forming units (CFUs) were counted on a medium.

RESULTS

Significantly more *SA* colonies were found on the skin surface after (post-EX) than before (pre-EX) exercise (35.8 ± 41.6 vs. 5.0 ± 5.2 CFU/15 cm^2; $P = 0.015$) and the numbers of nasal and skin surface *SA* colonies closely correlated ($P = 0.021$).

DISCUSSION

These results suggest that exercise-induced moistening of the skin with sweat significantly increases the amount of *SA* among nasal carriers. Because sweat on the skin surface might be associated with *SA* transmission among rugby players, athletes involved in physical contact sports should shower immediately after training or competition, and the importance of eliminating nasal *SA* should be emphasized.

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VITAMIN C AND E SUPPLEMENTATION EFFECTS IN INTERLEUKIN-6 AND C- REACTIVE PROTEIN SECRETION

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INTRODUCTION

Exercise increases several inflammation markers, especially Interleukin-6 (IL-6) and C-reactive protein (CRP)(1). Somestudies have linked the exercise-induced production of IL-6 and CRP with the observed elevation of hepcidin after exercise(1). Therefore, these responses are proposed to explain iron deficiency among athletes.The aim of this study was to elucidate the effect of vitamin C and E supplementation in the inflammatory response after exercise in healthy humans.

METHODS

Ten well-trained male students of Sport Sciences (26.9±6.7 years, 69.3±8.8kg and 176.6±7.5cm) participated in this study. Subjects received an oral supplementation with a combination of ascorbic acid (500mg/day) and RRR-α-tocopherol (400IU/day). Before and after 28 days of supplementation the participants performed 1.5h running trial at the speed corresponding to the 75% of the maximum oxygen consumption (VO_2max) previously determined. Venous blood samples were obtained pre-trial (BS), immediately post-trial (0 h), and at 3, 6, and 10 h post-trial.

RESULTS

IL-6(BS: 0.358±0.251 vs. 0.365±0.311 pg/mL; 0 h: 16.115±7.879 vs. 15.685±6.510pg/mL; 3 h: 8.553±6.150 vs. 4.748±3.201 pg/mL; 6 h: 8.381±11.989 vs. 3.568±2.834 pg/mL; 10 h: 9.062±15.519 vs. 3.241±3.641 pg/mL, before and after supplementation respectively) and CRP(BS: 0.036±0.019 vs. 0.048±0.037 mg/dL; 0 h: 0.036±0.018 vs. 0.049±0.035 mg/dL; 3 h: 0.035±0.018 vs. 0.048±0.034 mg/dL; 6 h: 0.057±0.036 vs. 0.074±0.050 mg/dL; 10 h: 0.125±0.086 vs. 0.125±0.095 mg/dL, before and after supplementation respectively)levels were not significantly different after supplementation). However, both responses were significantly higherafter exercise regarding to baseline levels.

DISCUSSION

Fischer et al. (2) reported that vitamins C and E inhibit the release of IL-6 from contracting human skeletal muscle. By contrast, there were not IL-6 and CRPinhibitionafter supplementation in our study. Although the response of IL-6 tended to be lower after supplementation, this reduction was not significant. Nevertheless, there wasan increase of inflammatory response after exercise regarding to baseline levels such as Peeling et al. showed in their study (3). More studies are necessary to understand these complex mechanisms.

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Oral

QEEG AND NEUROMODULATION (TRNS / TRANSCHRANIAL RANDOM NOISE STIMULATION) APPLICATIONS FOR SPORT AND HIGH PERFORMANCE

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INTRODUCTION

Quantitative electroencephalography (QEEG) reflects brain electrical activity and can help us to understand processes that underlie skilled performing. A common problem with EEG is that brainwaves data is often contaminated by artifacts of non-cerebral origin. Unfortunately, such artifacts tend to be exacerbated when the subject is in motion;therefore obtaining reliable data during exercise is not an easy task. These problems may explain the limited number of studies using QEEG as a methodologicaltool in the sports sciences. Not to collect movement artifacts during EEG recording we use alternative paradigms which avoid recording during physical exertion. With practical and computational techniques we confront the challenges in raw EEG recording during physical exercise.We propose brain noninvasive stimulation tRNS as neuromodulation technique to train peak-performance. A knowledge of practical aspects of EEGrecording along with the advent of supercomputing offer a promising approach to obtain reliable EEG data during motion or to optimisehigh-performance in sports.

METHODS

Thirty semi professional sport subjects 52% females and 48% males, from 10 to 19 years old. Half of themparticipate in this training program during six months with Neuromomodulation (tRNS) or without Neuromodulation techniques. All of them record a QEEG and ERP in GO/NOGO paradigm before and after 6 months of training.

RESULTS

Sport who had been training during 6 months with Brain-noninvasive Stimulation methodology showed a significant increase in sport performance during and after stimulation sessions comparing to control group that did train without Neuromodulationtechniques.

DISCUSSION

The increase in peak performace by providing neuromodulationbased in QEEG/ERP endophenotype reduces fatigue during exercise and improves attention, speed, inhibitory response and anticipatory response ($p \leq 0.001$). Some QEEG endophenotypes like ADHD with SMR rhytmus in central cortex has an optimal performance in sports. Other neuromodulation techniques like non-invasive brain stimulation can improve inhibitory responses during a football game or tennis.

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TRADITIONAL VS CLUSTER SET CONFIGURATION: NEUROPHYSIOLOGICAL AND HEMODYNAMIC RESPONSES

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INTRODUCTION

Resistance training is traditionally designed by one or several sets of a number of repetitions in every exercise. While traditional set configuration requires performing each repetition in a continuous fashion where no rest is taken in between each repetition, cluster training consists of manipulating work and rest periods by breaking sets into small clusters of repetitions (1). The aim of this study was to describe the neurophysiological, mechanical and hemodynamic acute responses of traditional and cluster set configuration when they were equated with respect to volume, intensity and work-to-rest ratio.

METHODS

Eleven healthy sport science students participated in a total of 8 sessions, 5 of familiarization and 3 experimental sessions. The first one was conducted in order to calculate the time to failure during an isometric knee extensor exercise. This time was used to establish the individual work-pause for the cluster and traditional training sessions (conducted in counterbalance order and one week apart). Neurophysiological and dynamic parameters were recorded before and after training sessions. Motor evoked potential (MEP), Short intracortical inhibition (SICI) and Intracortical facilitation (ICF) were measured using transcranial magnetic stimulation device; voluntary activation (VA), twitch force (TF), maximal M wave (Mmax) and low frequency fatigue (LFF) were calculated by electrical nerve stimulation. Maximal voluntary contraction (MVC), rate of force development (RFD) were recorded with a load cell. Hemodynamic parameters Heart Rate (HR), mean blood pressure (MBP), Heart Rate Variability in frequency domain (total Power, low and high frequency; TP, LF, HF, respectively) were assessed also during the session. In addition, subjective perception of effort was also measured.

RESULTS

ANOVAs showed a significant session*time interactions ($p<0.05$) over the following variables: MEP, SICI, VA, TF, Mmax, LFF, HR, MBP, PSD, LF and HF, MVC and RFD. Post-Hoc analysis showed significant differences before and after for each session. However, there were significant differences between cluster and traditional training at the end of the sessions, indicating a higher change of these variables for the traditional session in comparison with the cluster session.

DISCUSSION

Traditional set configuration implicates higher central and peripheral fatigue with subsequent loss in maximal force values as well as greater hemodynamic stress, even when both training sessions were equated for the work-pause rate. This study could contribute to a better understanding of the physiological mechanisms underlying the cluster configuration.

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Oral

EFFICACY OF DRY NEEDLING IN ELDERLY WITH NONSPECIFIC SHOULDER PAIN: PILOT RANDOMIZED CONTROLLED CLINICAL TRIAL

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INTRODUCTION

Shoulder pain has a high prevalence in elderly people and provokes functional alterations (1). So, there are difficulties for its clinical diagnosis, lack of effectiveness in the treatment and not much evidence regarding invasive physiotherapy techniques in this population (2). Purpose: To determine the efficacy of a single physiotherapy intervention with deep dry needling on latent and active myofascial trigger points in older adults with nonspecific shoulder pain.

METHODS

Pilot study, single blind randomized controlled clinical trial on 20 subjects aged 65 and overwith nonspecific shoulder pain. The study was approved by anethics committee and based on previous studies (3,4). Sample was recruited at their home and at a care center, and randomly distributed in Experimental Group (n=10), which received a session of deep dry needling on an active and a latent myofascial trigger points of the infraspinatus muscle; and Control Group (n=10), receiving a session only on an active myofascial trigger point. A blind examiner evaluated pain intensity, pain pressure threshold (anterior deltoid; extensor carpi radialis brevis) and maximal grip strength, before, immediately after intervention and after a week of treatment.

RESULTS

Statistically significant differences ($p<0.05$) in pressure pain threshold of the extensor carpi radialis brevis were found in the Experimental Group, immediately and a week after treatment. The effect size values (d Cohen) immediately and after a week varied from small for strength (0.017; 0.36), moderate for pain intensity (0.46; 0.78) and pressure pain threshold in anterior deltoid (0.49; 0.66), to very high for pressure pain threshold in extensor carpi radialis brevis (1.06; 1.58).

DISCUSSION

Deep dry needling on latent myofascial trigger points of the infraspinatus muscle increases the Pressure Pai n Threshold on epicondyle musculature, immediately and after a week, in the elderlywith non-specific shoulder pain, coinciding with the same segmentary level of innervation according to previous studies (3,4). In spite of the lack of a placebo control group, dry needling could be an important consideration in the resistance training and fitness in the elderly.

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IMPROVING QUALITY OF LIFE AND FITNESS IN A WOMAN WITH PARKINSON'S DISEASE. A CASE STUDY

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INTRODUCTION

Physical activity levels decrease faster in seniors suffering from Parkinson's Disease (PD) compared to healthy individuals. Furthermore, research has shown that exercise stimulates dopamine synthesis, decreasing PD symptoms (1). The purpose of this case study was to measure the efficacy of a 5-month intervention in a woman with PD. In accordance with evidence-based guidelines (2), a multifactorial exercise intervention (MEI) was designed with five goal-oriented training protocols: cognitive movement strategies, cueing strategies, balance, joint mobility and muscular power.

METHODS

The participant was a 71-year-old woman withmid-phase PD, (4 points on the Hoen and Yahr scale (3)). She completed a 5-month program consisting of bi-weekly supervised training and daily self-regulated exercise. Senior Fitness Test (SFT) (4), United Parkinson's Disease Rating Scale (UPDRS) (5), Berg Balance Scale (BBS) (5) and The Parkinson's Disease Questionnaire (PDQ-39) (6) scores were compared in a pre-post analysis.

RESULTS

The participant showed improvement in all measures. Her SFT score increased from Below Average, or At risk for loss of functional mobility, to the Normal Range score in four out of the five tests. Her UPDRS section III score decreased from 37 to 17 points and her BBS score improved from 26 to 43. PDQ-39 showed a moderate decrease in the total score (82% to 74%) with greater improvements in [the categories] Stigma (88% to 63%), Emotional Well-being (88% to 75%) and Bodily Discomfort (83% to 67%).

DISCUSSION

As expected (1), the outcomes provide preliminary evidence of improved quality of life and fitness markers, following an MEI in women suffering from PD. Larger studies are needed to confirm these findings and investigate whether a causal relationship exists between MEI and improvement in physical function in women with PD, and how that impact motor performance and quality of life measures.

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Oral

ARTERIAL STIFFNESS AFTER AN EXERCISE PROGRAM IN PATIENTS SUFFERING FROM CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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INTRODUCTION

Arterial stiffness, a strong predictor of cardiovascular mortality, is abnormally elevated in patients with chronic obstructive pulmonary disease (1). Although exercise training is one of the most powerful interventions to provide symptomatic relief in patients with COPDit is unclear the influence of exercise on arterial stiffness (2). The purpose of this study was to assess whether strength combined with HIIT training may decrease arterial stiffness in elderly patients with COPD.

METHODS

Twelve male COPD patients (83.7 ± 2.9 years) from Geriatric Hospital Virgen del Valle participated in the study. A cross over design study was used. Patients followed a 9-week strength + HIIT exercise program (two sessions per week, 45 minutes-session). Exercise program was supervised by heart rate (HR), Borg RPE scale and oxygen saturation (SpO2) with a pulse oxymeter. Carotid-radial pulse wave velocity (PWV), pulmonary function, basal HR, systolic and diastolic blood pressure and the six-minute walk test (6MWT) were measured before and will be measured after the intervention. Subjects' COPD level was calculated according to their Body mass index, airflow Obstruction, Dyspnoea and Exercise capacity (BODE index). The intervention will be finished by the end of May 2014.

RESULTS

Subjects were initially classified as COPD level 1.6±0.7 (low to moderate). The results of the initial assessment were PWV 7.6 ± 0.6 m/s; systolic and diastolic blood pressure 136.9 ± 23.0 mmHg and 78.6 ± 9.2 mmHg respectively;total walking distance 278.2 ± 102.5 m;pulmonary function FVC 73.2 ± 11.4 %; FEV1 64.6 ± 18.4 %; FEV1/FVC 0.65 ± 0.13; and basal heart rate 75.5 ± 9.7 bpm.

DISCUSSION

Baseline PWV was lower than other studies (3) and this value is expected to be reduced significantly (±11%) as in other studies (1). Reductions in systolic and diastolic blood pressure are also predicted according to Vogel et al., (4). An improvement is also expected in walking distance (±20%) similar to the data obtained by Vivodtzev et al., (4). Pulmonary function could be increased by 0-10%. If the results are as expected, it could be argued that an exercise program involving strength + HIIT exercise bouts could improve arterial stiffness according to Vivodtzev et al.(1) and Vogel et al.(4), taking into consideration that these authors focused their training programs on either endurance or HIIT.These estimated results would improve patients' quality of life.

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EVALUATING LONG TERM FUNCTIONAL OUTCOME AND FATIGUE RELATED EFFECTS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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INTRODUCTION

ACL reconstruction (ACLR) operation aims to restore stability to allow return to sport. However, patients often still have functional deficits even after the rehabilitation and do not successfully return to their pre-injury sport level (1). The purpose of this study is to identify lower extremity performance deficits in patients after ACLR by applying the most common objective functional test: the single-leg hop test. The effect of fatigue (2) on lower extremity functional performance is also investigated.

METHODS

Approval for the study was obtained (Leeds East PR Committee). Nineteen patients (age=32.2±6.6; years from surgery=4.91±1.8) after ACLR were tested. First, in pre-fatigue conditions, the patients were asked to stand on the test leg and then hop as far as possible and land on the same leg, three times each leg. The uninjured leg was used as control with respect to the injured leg. Then, the patients underwent a fatigue protocol consisting on repetitions on a leg press machine. Finally, participants executed the hop test as before (post-fatigue). Means and standards deviations were calculated. Paired *t*-tests were used to determine if significant differences occurred. Data were normally distributed.

RESULTS

Pre-fatigue: hop-length for the injured leg was 117.0±24.6 cm; 123.1±22.5cm for the un-injured. Mean difference between legs was 6.1cm; ($p<0.004$). Post-fatigue: hop-length for the injured leg was 103.6±23.4cm; 109.1±20.9cm for the uninjured; mean difference was 5.5cm; ($p<0.014$). LSI (low symmetry index) was 94.87±7.30 pre-fatigue and 94.53±9.62 post-fatigue ($p=0.873$). 79% of the patients obtained normal LSI (3) pre- and post-fatigue (LSI>90).

DISCUSSION

Significant differences were observed between legs in both pre- and post-fatigued situations. However, most of the patients present normal LSI. An acceptable LSI of >90% may not be demanding enough. By increasing the acceptable LSI level to 95% or 100%(1), only 37% and 21% patients obtained normal LSI, respectively, so the results are considered poor (after fatigue, 42% and 16% respectively). In conclusion, consideration of the LSI for evaluating the effects of rehabilitation requires further study. Hop performance must be presented as both absolute values and the LSI (1). Fatigue does not affect the performance for this test, which is not consistent with previous studies (2).

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Oral

RELATIONSHIP BETWEEN DIFFERENT FITNESS TESTS AND COGNITION IN PEOPLE WITH MILD COGNITIVE IMPAIRMENT

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INTRODUCTION

Amnestic Mild Cognitive Impairment (a-MCI) is usually considered a transitional phase between normal aging and Alzheimer´s disease (Petersen, 2004). There is increasing evidence about the benefits of fitness for cognition in people with a-MCI, but many questions remain open. The aim of this study was to explore the baseline correlations and power of prediction of different fitness tests with cognitive measurements in this population.

METHODS

Forty-one people diagnosed by trained neurologists with Amnestic Mild Cognitive Impairment, according to Petersen (2004) criteria, were recruited from the Neurology Unit of the Hospital de San Vicente delRaspeig (Spain). Fitness tests included the 6 minutes walk test (6MWT), the 8-meter walk test (speed of gait), the timed get up and go test (TGUG), and the Chair-Stand test (CST). Cognitive measurements included the Mini Mental State Examination (MMSE), the Adas Cognition, the Thurstone's Word Fluency Test, and the CERAD for visual memory. Partial correlations and a stepwise linear regression model were used in order to explore baseline associations between fitness tests andcognitive measurements.

RESULTS

Partial correlations controlling for age, gender and education showed an inverse relationship between speed of gait and the MMSE ($p<0.05$), andvisual memory ($p<0.005$);as well as a positive correlation withthe Adas-Cog. ($p<0.01$). The Chair Stand Test showed a positive correlation with the Thurstone's Word Fluency Test ($p<0.05$). When a regression model was applied, speed of gait remained as a predictive variable for the MMSE ($F=8.549$;Anova $p=0.000$; $R^2=0.445$; $\beta=0.375$; $p=0.01$), and the Chair Stand Test remained as a predictor variable for the Thurstone's Word Fluency Test($F=9.149$; Anova $p=0.000$; $R^2=0.495$; $\beta=0.385$; $p=0.007$).

DISCUSSION

Exercise seems to be a promising strategy for improving cognitive function in people with MCI (Lautenschlager et al. 2008), although the number of studies is limited and the association between different field fitness tests and cognition has not been fully explored. In our study the fitness tests that best correlated with cognition were gait speed and the Chair Stand Test. Exercise interventions should consider incorporating these tests to evaluate the outcome of the programs.

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CAN A SESSION OF HYPOPRESSIVE EXERCISES PROVIDE ACUTE EFFECTS ON FITNESS TRAINERS?

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INTRODUCTION

Hypopressive Exercises (HE) has been created by Dr. Caufriez for postpartum physical therapy (1) andis popular for their possible effects on abdominal and pelvic floor muscles (2) and perineal dysfunctions (3). Acute effects performed by physically active women showed changes in waist circumference and extensibility of the lumbar spine (4). Therefore, the purpose of this study was to investigate the immediate effects of one session of dynamic HE on different anthropometric and physical parameters on fitness trainers.

METHODS

Was designed a study with evaluation before (pre) and immediately after a twenty-minute HE Dynamic protocol (post), for a group of fitness trainers already familiar with hypopressive technique. Sample consisted of n=19, [36.6 years old (SD=6.0)].A pressure biofeedback device and a peak flow meter were used to measure abdominal hollowing maneuver and peak expiratory flow, respectively. Thoracic amplitude and waist circumference were also assessed. Variables were analyzed using multifactorial analysis of variance (ANOVA) and statistical adequacy of the fitted models was evaluated using the graphical analysis of residuals.

RESULTS

Significant differences ($p<0.001$) were foundforwaist circumference [81,21 (0,26); 78,89 (0,26) cm], abdominal hollowing maneuver [65,89 (0,86); 60,06 (0,91) cm], thoracic amplitude [6,21 (0,71); 8,33 (0,71) cm] and peak expiratory flow (491,87 (5,60); 519,37 (5,60) L/m].

DISCUSSION

The results suggestthat it's plausible expect acute changes in waist circumference, thoracic amplitude, peak expiratory flow, and abdominal hollowing maneuver after a workout of dynamic HE performed by fitness trainers. Similar results were provided on waist circumference (4). In this study acute effects occurred on thoracic amplitude and expiratory flow with a single workout. Probably such changes may be due to intermittent apneas of the respiratory hypopressive technique. Transversus abdominis is mainly activated during abdominal hollowing, during HE deep muscular abdominal activation is observed (2). This could be related with the results on waist circumference and abdominal hollowing suggested by the present study.

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Oral

EFFECT OF ACUTE EXPOSURE TO MODERATE ALTITUDE ON THE MUSCLE CONTRACTILE PROPERTIES MEASURED BY TENSIOMYOGRAPHY

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INTRODUCTION

There is controversy regarding the neuromuscular responses occurring at hypoxic conditions. It has been suggested that hypoxia could create an advantageous environment to improve fast fibre type muscle recruitment. Different neuromuscular assessment techniques have been applied, coming up with contrasting results. Tensiomyography (TMG), a non-invasive indirect measurement of muscle contractile characteristics, has been employed in the detection of muscle fatigue, fibre composition and muscle adaptive processes. The aim of this study was to investigate the TMG capability to detect changes in the muscle contractile properties, following an acute exposure to moderate altitude.

METHODS

Biceps femoris and vastuslateraliscontractile properties were assessed on18 elite taekwondo athletes (age 20.1±6.1yrs; weight 65.38±13.94kg) at sea level and moderate altitude (2320 m)by using TMG. Measurements were recorded through single twitch electrical stimuli (1ms duration) at several intensities (40, 60, 80 and 100mA). TMG analysis included maximum radial displacement of muscle belly (*Dm*), time of contraction (*Tc*), activation time (*Td*) and maximum contraction velocity (*Vc*) in both, normoxic and hypoxic conditions.

RESULTS

When vastus lateralis was assessed in hypoxia, *Dm*was lower at 40mA (4.6±2.01vs 5.1±2.12mm; p=.008; ES=-.237) but non-significant differences were found at higher electric stimulations. (P≥.05). *Vc*was significantly lower under hypoxia only after 40 (171.62±80.94vs199.52±73.01mm/ms;z=-3.010;p=.003,ES=-.77) and 60mA (236.75±98.19 vs 255.5±91.49mm/ms;z=2.16, p=.047, ES=-.51) stimulation frequencies. *Tc*was always longer at altitude compared to sea level, significantly different when stimulating at 40 (27.93±6.09vs24.72±5.31ms; z=2.15, p=.031, ES=.56) and 100mA (25.22±3.51vs23.4±3.71ms; p=.03, ES=.51). *Td*was also longer at altitude than sea level in all stimulations employed (P<.05, ES≥.33). Biceps femoris TMG data analysis revealed lower Dm and Vc in all electrical stimulations employed when compared with sea level measurements (Dm: P<.001, ES>0.61; Vc: P<.001, ES>.55). No significant differences were found in Tc (P>.05, ES>-.19) and Td values (P>.05, ES>0.11).

DISCUSSION

The main outcome of this study is that TMG appears to be effective atdetectingchanges in themuscle contractile propertiesat hypobaric acute hypoxia. Slower contraction velocities, smaller radial muscle displacements and greater times of contraction seem to reflect analtered-muscle profile when acutely exposed to moderate altitude. However, varying responses were observed depending on the muscle assessed and the electrical current employed. Further research involving TMG will provide a better insight into the changes occurring in the muscle contractile properties during acute and chronic exposures to altitude.

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DOES HYPOPRESSIVE TECHNIQUE AND PILATES INCREASES THE ACTIVITY OF THE STABILIZING CORE MUSCLES?

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INTRODUCTION

Pilates (abdominal hollowing techniques) and hypopressive techniques are used for activating deep abdominal musculature and cause low compressive spine stress (Richardson & Jull, 1999). The aim of this study was to investigate surface electromyographic (EMG) activity of the rectus abdominus (RA) and internal oblique abdominus (OI) muscles during abdominal-hollowing (AH) and hypopressive technique (HT) exercises performed in on supine position with legs and knees bent at 90º (Bjerkefors A, 2010).

METHODS

Ten healthy female participants, aged 31.4 ± 4.92 years, were recruited to the experiment. Participants performed a maximal voluntary contraction (MVC) of abdominal muscles (OI and RA) during 5 s where muscle activity was recorded employing surface electromyography (EMG). EMG data of each muscle during the AH, HT were normalized as a percentage of the MVC.

RESULTS

The results showed significant differences in EMG activity between OI and RA for the two exercises ($p < 0.05$). The HT task produced lower activation of RA than AH ($p = 0.042$), on the other hand. The AH technique produced an increase around 20% of the MVC in OI EMG levels compared to HT.

DISCUSSION

The results suggest that the performance of AH and TH on the supine position with legs and knees bent at 90º can facilitate OI activity with minimal activity from RA. Similar results were obtained by Richardson et al. (1995) and Bjerkefors et al. (2010). These exercises can be used in lumbo-pelvic stability programs and for working with low superficial muscles activation (Hodges, 2003).

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Oral

EFFECTS OF USING A COOL VEST IN THE NEUROMUSCULAR FUNCTION ON SPECIFIC SOCCER ACTIONS

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INTRODUCTION

Soccer is a high intensity sports time that involves two 45-minute halves with a 15-minute break at half time. Player's performance is affected due to physiological factors among others. The ability to complete explosive actions such as sprints and jumping is reduced throughout the match[1]. Nevertheless all these signs will spread during the last 15 minutes of the match, some studies suggest a decrease of intensity level on the initial 15 minutes of the second half compared to the first half. High core temperature is an element that seems to reduce the capacity to perform high intensity exercises and mid-long duration endurance activities[2-4]. Body cooling is a method which could beneficiate cardiovascular system, metabolism and on the central and peripheral nervous system changing sensorial feed-back of thermoregulation system[5, 6]. This encourages the idea that in team sports like soccer, this method could be interesting applied during match's half time to recover strength baseline levels. The purpose of the present study was to investigate the effects of a cool vest used as a cooling method during the half part of a match within the neuromuscular function of soccer players.

METHODS

Nineteen football players participated. A repeated-measures design was used. Participants completed the FIFA 11+ warm up. After that, three randomly assigned neuromuscular tests, such as Countermovement Jump (CMJ), 30-meter sprint, in which maximum peak velocity and the final time were recorded and a shot speed test, consisting in a shot to a goal at a 2 meter, considering that more distance could be detrimental to shot power, were measured. Then an intermittent protocol was undertook employing 5 repetitions of 9 minute bouts of different running speeds on a motorized treadmill based on an adapted study of Spanish soccer players match analysis [7]. After the intermittent protocol the participants remained seated resting for 15 minutes simulating soccer half time. Recovery involved either no cooling or the application of the cool vest.

RESULTS

We observed a fatigue-induced effect on all three neuromuscular test outcomes conducted from baseline values to post-exercise values, decreasing 30m sprint, CMJ and Shot Speed abilities performance. No significant differences were found except for the Shot speed test (p=0.043) from cool vest group in which the outcomes were better than the baseline test. We also observed that cool vest group had less reduction of tests outcomes than control group.

DISCUSSION

The effects of the cool vest as cooling method during the recovery time did notsignificantly maintain or improve the baseline values of neuromuscular tests we applied,compared with control group. Reduction of baseline outcomes in sprint ability and CMJ corroborated the results of others studies [8, 9].However, slightly better values were found in cool vest group[10, 11] compared with control group and their baseline results.Furthermore, applying during more time the cool vest or until as close as possible to theexercise should be more beneficial for endurance and sub-maximal activity like soccer. Theergogenic benefits of effective cooling procedures for team-sports neuromuscular activities arenot significantly maintained compared with control group and baseline values.

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BE FIT AND SMART: TEAM SPORTS PRACTICE IMPROVES PHYSICAL FITNESS, SUSTAINED ATTENTION AND ACADEMIC ACHIEVEMENT IN ADOLESCENCE

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INTRODUCTION

The interest on the relationship between sport practice, physical fitness, and cognitive processing is increasing in recent years[1]. Here, we focused on team sports practice as a key factor involved in fitness level, vigilance (i.e., the ability to maintain focused attention) and academic achievement in male and female adolescents.

METHOD AND DESIGN

Two groups of participants (N=75) were selected on the basis of their team sports (football) training habits. Participants were evaluated in two separate sessions (1st session: Vigilance Task; 2nd session: Leger Multi-stage fitness test). In addition, a brief anthropometric assessment was conducted to obtain their body mass index and the academic achievement was annotated.

RESULTS

Physical fitness: Time-to-exhaustion (TTE) data revealed a main effect of Training ($p<.001$), and Sex ($p<.001$), with larger TTE values for the trained than for the untrained group, and for males than for females participants. *Cognitive processing:* Reaction time (RT) data showed a main effect of Training ($p<.001$), with trained participants responding faster than untrained, and a main effect of Time on task ($p<.01$), with participants responding slower as the time on task increased. The analysis on the number of lapses (RT>500ms) revealed a main effect of Time on task, ($p<.001$), with the number of lapses increasing as time on task went by, a significant main effect of Training ($p<.001$), with trained participants committing fewer lapses than untrained, and a significant interaction between Time on task and Training ($p=.04$), with the vigilance decrement being more pronounced in untrained than in trained participants. *Academic achievement:* Academic performance was better in trained than untrained group ($p<.001$).

DISCUSSION

Results confirmed our predictions with trained participants showing improved physical fitness and vigilance performance (faster responses, fewer lapses and seemed to be less prone to vigilance decrement over time) than untrained. More importantly, football players also resulted in improved academic performance. The present study revealed the impact of team sport practice on achievement an all-around development of the adolescent. In line with previous studies, we suggest that physical fitness might be an important factor to explain the differences in cognitive performance.

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Oral

SEQUENCING TRAINING AND PERFORMANCE IN RHYTHMIC GYMNASTICS

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INTRODUCTION

In competitive periods rhythmic gymnastics training demands a great amount of repetitions of the competitive exercises. In order to maintain an optimal performance level that best helps gymnasts to achieve highest results, it is desirable to control the training pattern referred to the sequencing of the exercises. Little has been brought about in scientific literature (2). High volumes in hours of training predict best performance (1). However highest training loads are not always effective, and there is a need to establish a correct pattern of training load and intensity according to the fitness level of the gymnasts (4). Pre-competition warm up intensity is highest in elite than sub-elite gymnast that perform a fewer amount of routines (3). The objective of the study is to correlate de sequence: number and order of execution of competitive exercises and the scores achieved: total points, execution points and difficulty points.

METHODS

Eigth National level gymnasts, junior and senior, with more tan 8 years of experience participated. During 12 weeks previous to Nationals, and in every training sesión they performed a pattern of 10 repetitions of the competitive routine. According to the order of performance each exercice was given a sequence value: 1st, 2nd, and so up to 10th. Two international expert judges evaluated for difficulty, execution and final score.

RESULTS

The highest final, execution and difficulty scores are obtained in exercise 5th, followed by 4th and 3rd. The lowest values correspond to exercises 9th and 10th, both in final and partial scores.

DISCUSSION

These data suggest that the gymnasts need to perform a mínimum of four exercises repetitions before achieving their best performance score, getting worse as it progresses the number of exercises performed, possible consequence of the onset of fatigue. Sequencing the exercises and identifying best performance patterns could contribute to design competitive training loads and competition warm-up strategies.

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CRITERION AND CONCURRENT VALIDITY OF THE 7 DAY-PAR IN SPANISH ADOLESCENTS

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INTRODUCTION

Valid measures of physical activity (PA) are necessary to generaterigorous knowledge in the field of PA and health (1). This study analyses the validity of the self-report questionnaire Seven Day Physical Activity Recall (7 Day-PAR) (2) in Spanish adolescents. For this purpose, we analysed the relations of 7 Day-PAR data with accelerometer data (concurrent validity)and with the aerobic physical fitness and body fat percentage of the sample (criterion validity).

METHODS

The study was carried out with a sample of 123 Spanish adolescents (*M* = 14.85; SD = .87). Physical activity was measured by the 7 Day-PAR and the GT3X Actigraph accelerometer. Aerobic fitness was estimated by the 20-m shuttle run test. Body fat percentage was measured using a bioelectrical impedance scale (Oregon Scientific GR101).

RESULTS

Correlations of "moderate" and "hard" PA (7 Day-PAR) with "moderate" and "vigorous"PA (accelerometer) were low (r= .25, p<.01;and r= .18, p<.05, respectively). "Very hard" PA (7 Day-PAR) showed a higher correlation with "vigorous" PA (accelerometer) (r= .38, p<.05). "Very hard" PA (7 Day-PAR) and "vigorous" PA (accelerometer) negatively predicted body fat percentage (b= -.29, p<.01 and b= -.45, p<.01, respectively), and positively predicted aerobic fitness (b= .41, p<.01 andb= .51, p<.01). However, "moderate" PA (7 Day-PAR) positively predicted body fat percentage (b= .20, p<.05).

DISCUSSION

The 7 Day-PAR showed acceptable validity for the measurement of "very hard" PA andlow validity for "hard" PA. This questionnaire showed a problem in the measurement of "moderate" PA, since previous studies have pointed out that "moderate" PA is negatively related to body fat percentage (3)."Moderate" PA collected by self-report methods is likely to be underestimated (4). It seems that young peoplefind it difficult to report their time in "moderate" PAproperly, because it tends to be more sporadic, nonplanned, and therefore less memorable and quantifiable than high-intensity activities (4).

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Oral

METABOLIC POWER IN TENNIS: NEW APPROACH TO UNDERSTAND THE PHYSICAL DEMANDS

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INTRODUCTION

Tennis is characterized by high intensive work periods interspersed with moderate long and rest periods (1). However, these researches did not analyse the speed of movements or accelerations. Due to small size tennis court, it is more important to analyse the accelerations than tennis players' speed. Recent research from different sports have been analyzed the activity demands of training and match-play (2,3). These demands are based on theoretical model that allows the estimation of the energetic cost of accelerations and decelerations, it is called as metabolic power.

METHODS

Seventeen female and twelve male young high-level tennis players (Spanish Tennis Ranking) took part in the study (mean age: 14.0 ±2.9 years). They were members of different age divisions (beginners: 11-12 years; youth: 13-14 years; teenager: 15 years; and junior: 17-18 years) in High Level Performance Centre of Aragon Tennis Federation. They had been playing between 3 and 5 years in high-level competition and at present they are in the first places of the ranking. All tennis players were tracked from 1 to 3 matches (n=87). Data were collected using eleven portable GPS devices (MinimaxXv.4.0, Catapult Innovations) operating at a sampling frequency of 10 Hz. The analyzed variables were: energy average metabolic power (AVG>0, AVG>10, AVG>20, AVG>35, AVG>55 all in w/kg), total energy expenditure (ENG), estimated distance (ED), equivalent distance index (EDI) and metabolic efforts (EE>10, EE>20, EE>35, EE>55, all in w/kg). 12 Reliability and accuracy of the devices used in this study had been assessed in short distance exercises (4).

RESULTS

Metabolic power data could be a useful variable to determinate tennis players' physical demands and sensitive indicator to compare among them. The greater part of distance covered by tennis players was realized during accelerations and decelerations (89.2%). Besides, tennis players' metabolic power depends on qualifying round in tennis tournament and ranking of players. Metabolic power demands in final round were higher than in quarter-final round (EE>10 W/Kg; p=0.03). Higher ranking players developed higher metabolic power demands in final round than lower ranking players (HR=17.8 vs. LR=13.7 Kj/Kg; p= 0.14). However, lower ranking players developed higher metabolic demands in quarter-final round than higher ranking players (HR=14.0 vs. LR=16.6 Kj/Kg; p= 0.22).

DISCUSSION

To the authors knowledge the present investigation represents the first attempt to quantify the metabolic power values to tennis players in match-play. Recent research in tennis had analyzed metabolic parameters such as: Vo2, lactate or heart rate (5,6) However, these research did not analyzed metabolic costs of tennis players. In relation, there were some research which had analyzed the metabolic cost of soccer players (2,3). These researches concluded that metabolic power data contribute to a better knowledge about the physical demands or external-load in tennis players. This is a previous step to adequate training load that simulating matches' demands.

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TEST-RETEST RELIABILITY OF MAXIMAL 750M FREESTYLE ENDLESS POOL SWIMMING

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INTRODUCTION

Elite triathletes obtain similar physiological values as single-sport athletes despite training time divided among three disciplines (1). Yet researchers have long expressed the need to develop experimental protocols capable of replicating the sequential demands of the sport to investigate different training and nutritional interventions on triathlon performance (2). The swim component of triathlon testing is typically undertaken in a 25 or 50mpool with swimmers performing numerous turns to achieve the required test distance. Turns have a deceleration and acceleration component not present in open water triathlon swimming. Additionally, fixed length pools are often not in close proximity to cycling and run test facilities. An alternative approach is to utilise an easily re-locatable swimming flume (Fastlane pool™, Endless swimming pools, USA) however to our knowledge there are no published studies reporting the test-retest variability in athlete swim times using this method. The objective of this study is to report the athlete test-retest reliability of simulating the swim of a sprint triathlon in fast-lane pool.

METHOD

Fifteen age-group swimmers or triathletes of various abilities provided written informed consent to participate. Two maximal 750m fastlane swims were undertaken a week apart, during which stroke rate and pace were recorded while distance was calculated using pace/time tables. Swim pace was increased or decreased accordingly by the tester (using a remote control) based on the swimmers ability to keep up with the water flow. Post swim heart rate, lactate and perceived effort values were also recorded. The pool temperature was kept at 26ºc, and the study was approved by an institutional ethics committee.

RESULTS

The reliability of competitive performance of athletes provides an estimate of the smallest worthwhile change in performance. Our within athlete typical variation results will be compared against the reported 1.2% typical within athlete race to race variation in the swim component for the top 10% of triathletes (3).

DISCUSSION

In comparison to actual competition, simulated sport performance provides better reliability to experimentally assess a particular intervention. The current data should be utilised by researchers interested in comparing the test protocol benefits and logistics of using a swimming flume versus a traditional swimming pool to test triathletes and assess factors that affect triathlon swim performance.

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Oral

SIMILAR EFFECTS OF TWO EQUATED CONCURRENT TRAINING PROGRAMS: ACSM RECOMMENDATIONS vs. A POLARIZED INTENSITY DISTRIBUTION

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INTRODUCTION

Previous studies have suggested the greater effectiveness of concurrent endurance and strength training when compared to strength and endurance training alone (1). However, there are no studies comparing concurrent training programs with different intensity distribution and equated loads. Thus, the aim of this study was to compare a concurrent training based on ACSM guidelines (2) with a concurrent training of equated load but with polarization of training intensities.

METHODS

After a 2 week-familiarization period, 31 sport science students were randomly distributed into 3 groups: concurrent training based on ACSM guidelines (AT), concurrent polarized training (PT), and control group (CG). Before and after 8 weeks of training with a frequency of 3 days a week, participants were evaluated on: resting heart rate variability (HRV), countermovement jump (CMJ), maximum aerobic speed (MAS), and estimated repetition maximum (RM) in bench press and half squat. AT performed running training at 65-75% of MAS, combined with resistance training (RT) at 10-12RM. PT performed brisk-walking at 35-40% of MAS and sprint training at 120% of MAS, combined with RT at 5RM and 15RM. The training loads of both experimental groups were externally equated. Pre-post and between groups differences were evaluated via analysis of variance (ANOVA). Cohen's *d* was also calculated for effect size (ES). Thresholds for effects were: 0.20 "small", 0.50 "medium", and 0.80 "large". The level of significance was set at 0.05.

RESULTS

AT and PT significantly improved MAS (ES: 0.37 and 0.36, respectively), and estimated RM in bench press (ES: 0.73 and 0.78, respectively) and in half squat (ES: 1.42 and 1.39, respectively) after the training period. Further, both AT and PT showed significantly higher half squat estimated RM in post-evaluation than CG (ES: 1.76 and 1.78, respectively). AT and CG significantly reduced CMJ height in post-evaluation (ES: 0.39 and 0.72, respectively), while HRV was not significantly altered after the training period in any group.

DISCUSSION

The main finding of the current study is that a concurrent training with polarized intensity distribution exhibited similar improvements on both cardiorespiratory and musculoskeletal fitness when compared to a concurrent training based on ACSM guidelines (2), although vertical jump performance was only maintained after the training period in PT. While these training programs were performed three days a week, it is still unknown how differences between programs would become evident with more training sessions per week and after a longer training period. The current results suggest the effectiveness of equated concurrent training programs of different training intensity distributions and moderate volume in physically active individuals.

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EFFECT OF RUNNING SURFACE AND FATIGUE STATE ON IMPACT ACCELERATION IN LONG-DISTANCE RUNNING

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INTRODUCTION

Running on a treadmill provokes biomechanical modifications in running gaitsuch as differences in stride frequency, contact time, ankle, knee and hip kinematics, muscle activity, energy expenditure or shock attenuation (1,2). Shock attenuation and the severity of the impact acceleration are two of the most important variables analysed in running research due to their hypothetical relationship with potential injury. While the differences between treadmill and overground running would seem to cast doubt on their equivalence as running surfaces, many authors nevertheless consider that running on a treadmill may be a representative expression of running overground. This study thus examined the effects of treadmill running on impact acceleration and the interaction between running surface and the runner's fatigue state.

METHODS

Twenty runners ran on a treadmill and overground (4m/s) before and after a fatigue protocol (30-min run at 85% of their individual maximal aerobic speed). Impact accelerations (tibia and head peak acceleration, tibia and head rate of change of acceleration [impact rate] and shock attenuation) were analysed by placing accelerometers on the runners' shank and forehead.

RESULTS

In pre-fatigue condition, running on the treadmill reduced head and tibial peak impact acceleration and impact rate compared to overground running, but no differences were observed between surfaces in shock attenuation. Moreover, no difference in acceleration between surfaces in post-fatigue condition was observed. There was a significant interaction between surface (treadmill vs overground) and fatigue state (pre-fatigue vs post-fatigue).

DISCUSSION

An altered environment such as running on a treadmill may force the runner to make adjustments in gait to maintain their performance or reduce the risk of injury (3), what could lead to modifications in the forces and accelerations experienced by the runner. The alterations in impact accelerations observed when running on the treadmill under no fatigue may indicate that running on a treadmill could also affect other relevant running parameters. Moreover, when running overground, fatiguereduced impact acceleration severity, but had no such effect when running on a treadmill. Thus, the effects of treadmill running and the interaction between running surface and runner's fatigue state need to be taken into account when interpreting the results of studies that use a treadmill in their experimental protocols and when designing sport equipment and prescribing physical exercise.

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Oral

INITIAL FOOT CONTACT AND CENTRE OF PRESSURE DURING WALKING AND RUNNING: IMPLICATIONS ON RUNNING PERFORMANCE

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INTRODUCTION

Foot's centre of pressure trajectory (CoPT) analysis plays a fundamental role in establishing the biomechanical patterns (1). Although walking and running biomechanics have been widely investigated (2, 3, 4), further studies have not been undertaken on the evaluation of these parameters at a personalised speed on the basis of a maximal running test.

METHODS

48 moderately trained participants were divided into 3 groups, according to running performance: highly-trained runners (HTR), middle-trained runners (MTR), and control (CON). Participants were assessed in: anthropometric characteristics, maximum aerobic speed (MAS), walking and running at individualised speed (i.e. 55% of the threshold speed between walking and running and 85% of MAS, respectively) in both barefoot and shod conditions, in order to study the initial foot contact (IFC) and CoPT. Same type of running shoes with homogeneous lacing pattern was worn, and the biomechanical analysis order was randomised. Between-group and biomechanical conditions differences were tested via analysis of variance (ANOVA). The significance level was set at 0.05.

RESULTS

HTR reached a higher MAS (mean (SD): 19.86 (0.68) km/h) than MTR (mean (SD): 18.47 (0.48) km/h) and CON (mean (SD): 16.6 (0.97) km/h) ($p<0.001$ for both). Further, MTR got a higher MAS than CON ($p<0.001$). Time percentage of a total foot roll-over (FRO) when walking barefoot, compared to shod condition, was shorter in the transition from heel contact to first metatarsal contact, and from heel off to push off in all groups ($p<0.05$ for all comparisons). Conversely, this percentage was higher when walking barefoot in the transition from flat contact to heel off in all groups ($p<0.05$ for all comparisons). Total time for FRO when running barefoot was quicker compared to shod condition in HTR and MTR ($p<0.01$ for both). Moreover, HTR and MTR showed a quicker total time for FRO when running than CON in both barefoot ($p<0.001$ and $p<0.05$, respectively) and shod ($p=0.001$ and $p<0.05$, respectively) conditions. The prevalence of forefoot IFC when running, in both barefoot and shod conditions, was higher in HTR (44.4% and 38.9%, respectively) than in MTR (33.3% and 26.7%, respectively) and CON (13.3% and 0%, respectively).

DISCUSSION

Our results show that forefoot IFC becomes more evident when the athlete's performance increases, as previously demonstrated (4). The shorter duration of FRO in the barefoot compared to shod running condition could be due to a more natural and anterior IFC. Therefore, according to previous studies (2, 3), running shoes might determine walking and running biomechanics in trained endurance runners.

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ORAL

REGENACTIV® TECHNOLOGY ASSESSMENT IN SOCKS FOR NORDIC WALKERS

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INTRODUCTION

There is strong evidence that confirms that physical activity provokes numerous benefits for the human health. However, physical activity may also lead to injuries or illnesses in specific areas of the body such as the feet. Some of these injuries are believed to be related to the interaction of the foot with the shoe and sock (Blackmore et al., 2011), as well as the skin hydration status. One way to prevent these injuries is the use of new fibers to develop textile materials (Pérez et al., 2007). In this sense, the objective of this study was to determine the influence of the socks "Regenactiv®" in the perception of comfort, and their contribution to the hydration level in the foot during physical activity, specifically Nordic walking**.**

METHODS

This study involved a total of 57 volunteers (12 male and 45 female [63.7 ± 2.5 years, 69.5 ± 8.6 Kg, 1.6 ± 0.11 m]) who walked at least 1h/day, three days/week during a month,and were free of injury and pain in their lower extremities so that their normal gait pattern would not be modified. A questionnaire was used to evaluate the hydration perceived comfort, through the variables "Height", "Adaptability", "Abrasions", "Temperature" and "Comfort". For the assessment of hydration, a skin hydration meter Hydrosensor (Microcaya, SL) was used. This instrument displayed a valuation from 1 to 10. The hydration measures were taken at five foot zones: "Heel", "Midfoot", "Head of fifth metatarsal", "Head of first metatarsal" and "Instep central zone".

RESULTS

The results showed significant improvements in two of the analyzed comfort variables: Comfort and Adaptability (~ 10%), and levels of hydration in the metatarsal heads of the 1st and the 5th toe (~ 9%). Discussion: In this study, the sock textile properties were analysed in order to find out their possible effect on physical activity. The sock Regenactiv® showed a significant increase in comfort and adaptability compared to the placebo socks, which can positively influence healthy physical practice. In terms of hydration, there was a significant increase, particularly in the head of the 5th and 1st metatarsals (9.1% and 8.3%, respectively). In conclusion, these types of socks can be a relevant element which may play an important role in the prevention and care of foot injuries.

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Oral

IMPACT OF LOW TO HIGH INTENSITY OF RESISTANCE TRAINING PROGRAM IN ENHANCING LEG STRENGTH AMONG MALES

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INTRODUCTION

Leg strength is very essential for sports persons, and especially for athletes. Leg strength is the capacity of the lower limbs to exert muscular force (Baumgartner and Jackson, 1991), (3). A Study pertaining to two days of training per week had shows improvement in the strength (Bell, 1990, Faigenbaum et al., 2002), (2,6). The purpose of this study was to investigate the impact of low to high intensity of resistance training program in enhancing leg strength among untrained males.

METHOD

A group of (N=30) untrained subjects were selected randomly for this study from the various classes of physical education college course, age of the subjects between 18-22 years. The training program was employed for 12 weeks, five resistance training exercises considered for the legs, 25 minutes of training per session, two days of training per week. The selected leg strength test considered for this study was sitting calf raises, standing leg curls, adductors, abductors, and leg extensions. The scores were recorded in kilograms. To find out the mean differences from pre to post test, mean, S.D and t-tests were computed by means of Statistica Software.

RESULTS

The analyzing of data reveals that the mean and standard deviation with regard to sitting calf raises performance among training group from pre to post test were (25.70, 12.70) and (64.83, 14.59) increased by 39%. Standing leg raises with mean and S.D were (23.12, 7.86) and (45.87, 14.92) increased by 50%. Abductor exercise with mean and S.D were (59.50, 13.86) and (109.83, 23.14) increased by 54.17%. Adductors with mean and standard deviation were (61.40, 25.27) and (113.10, 26.08) increased by 54.29%. Leg extension exercise with mean and S.D were (29.17, 15.43) and (49.80, 16.37) increased by 58.57%.

DISCUSSION

Twelve weeks of low to high resistance training program have a significant effect in enhancing leg strength among males. Similar results were obtained Hawkins and et.al, (2009) indicate that the high velocity and high force training programs on untrained college males, consisting of weight lifting, plyometric, improved the lower body performance, especially in the area of jump height and power (4). In the present study the selected college males were untrained and their scores were very low in the pre test pertaining to all the selected resistance exercises for the lower body. In the post test the participants had shows an improved performance in enhancing leg strength in all the selected resistance exercises.

CONCLUSION

It was concluded that the impact of low to high resistance training program in enhancing leg strength among the males had shows greater performance from pre to post test in all the selected exercises, which is very encouraging and significant.

KEY WORDS

Resistance, strength, Intensity, enhances.

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INFLUENCE OF LACK OF KNOWLEDGE ABOUT THE LOAD IN EXPLOSIVE PARAMETERS DURING BENCH PRESS THROWS

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INTRODUCTION

Muscle capacity to generate maximal force in early phases of movements is generally accepted as an important component of sport performance and it is an important indicator of the neuromuscular system performance (1). Therefore the ability to produce higher power in the first phases of the movements should be pursued as a goal of the strength training.

METHODS

Twenty eight physically active college students,with at least one year in bench press training, took part in the study. All subjects completed an informed consent document as approved by the Declaration of Helsinki. Participantsperformed 6 sets of 6 repetitions of pure concentric bench press throws with loads representing 30, 50 and 70% of their RM. In three of those sets, participants had knowledge (known situation) about the load lifted in each repetition (which was varied within the sets) and in the other three they did not have knowledge about it (unknown situation). During the protocol a rotary encoder were attached to the barbell to record data.

RESULTS

Repetitions performed during unknown situation showed higher values of power and ratio of force development during the initial phase of the bench press (30, 50, 100 and 150 ms), and the time necessary to achieve RFD-max with 50 and 70% of 1RM was smaller. Despite these results, no significant differences were found in peak power or maximum ratio of force development when the entire movement was analyzed.

DISCUSSION

Several studies have shown the relation between force production in early movement phases or the ratio of force development and performance in specific sport movements (2, 3). Therefore the higher power/RFD output during first moments of a bench press throws in unknown condition may indicate that this kind of stimulus (uncertainty) could be used in strength training to improve explosive parameters.

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Oral

THE INFLUENCE OF AUGMENTED FEEDBACK AND AN EXTERNAL FOCUS OF ATTENTION ON JUMP PERFORMANCE

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INTRODUCTION

Jump performance is essential in many sports but little is known how to optimize jump training. Thus, the aim of the present study was to investigate the effects of different parameters that enhance the quality and outcome of a training session. In Exp. 1, the short- and long-term influence of augmented feedback (aF) on drop jumps was scrutinized as previous studies investigating non-jumping movements indicated that provision of aFhas the potential to enhance performanceboth in the short- (1) and long-term (2). Exp. 2 investigated the influence of an altered focus of attention on jump height in countermovement jumps (CMJs). Previous studies have demonstrated thatinstructions that direct a performers attention externally enhancemotor skill performance(3).However, the efficacies of using an external focus of attention (EF) or an internal focus of attention (IF)has never been compared with the direct effects of aF.Therefore, theaim of experiment 2 was to identify the condition (aF, EF, or IF) that leads to the highestjump heights in CMJs.

METHODS

Exp. 1: 34 participants were assigned to three groups that trained drop jumps for four weeks with different relative frequencies of aF: 100%, 50%, or 0%. The jump height was displayed as aF. Exp. 2: 19 volunteers performed 12 series ofmaximum CMJs. Changes in jump height between conditions (aF, EF, or IF)and within the series of each condition were analyzed.

RESULTS

Exp. 1: A positivewithin-session effect of aF on jump height was observed before and also after the training period ($p<0.001$: pre +4.6%; post: +2.6%). In the long-term (comparing pre- to post-measurement), the 100% group showed the greatest increase in jump height (+14%), followed by the 50% (+10%) and the 0% group (+6%) (time*group interaction: $p<0.05$). Exp. 2: Jump heightsdiffered significantly between conditions ($p<0.001$) and the highest one was observed in aF (32.0±7.1 cm), followed by EF (31.2±6.6 cm) and IF (30.7±6.8 cm).

DISCUSSION

Exp. 1 highlights an immediate beneficial effect of aF on jump height in the pre- and post-test. The long-term resultsafter training show that the higher the feedback frequency the higher theperformance gains. The results of Exp. 2 show that providing aF is more efficient to foster jump performance than using an EF or IF. Based on these two experiments, it is recommended to includeaF with a high frequency in jump training.

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EFFECTS OF A 6-MONTH RESISTANCE TRAINING ON HEART FUNCTION AND PHYSICAL FITNESS IN STABLE PATIENTS WITH CHRONIC HEART FAILURE

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Resistance training (RT) is part of international recommendations in healthy life style in older adults, healthy population and in patients with chronic heart failure (CHF). The study of effects of RT on heart function and adaptation to this type of training is not well known. The aim of this study was to determine the effects of a 6-month-RT left ventricular (LV) function (end-systolic, end-diastolic volumes, ejection fraction) and physical fitness (treadmill test, upper and lower body strength test with linear encoder) in CHF patients with functional class II and III of New York Heart Association. To date, 5 patients (mean age 64.2±4.4 years; 4 men, 1 women) were enrolled and performed 45 RT exercise sessions (6 months, 2 days per week). The program was structured in aerobic exercise and six different exercises on circuit weight machines with personalized workload 75% of 1RM. Heart function (echocardiography) and physical fitness parameters were assessed at baseline and at 6-month-followup. Results: All patients completed the training program, none presented adverse events. Modest improvements in end-systolic volume (pre:90.3 ml, post:104.2 ml) and end-diastolic volume (pre:145.8 ml, post: 159.2 ml). Ejection fraction improved 4.6% (p=0.019); physical capacity significantly increased(pre:7.4±2.5 Mets,post: 9.0±2.9 Mets; p=0,0249) in the treadmill test; maximal muscle strength testing significantly increased: Vertical Chest Press 41% (p<0,05) , Press Machine Shoulder Press 44% (p<0,05), LatPull-down 14% (p<0,05), Seated Row 78% (p<0,05), Leg Extension 29% (p<0,05)). Conclusion: A structured RT program improves measures of resting LV function and physical fitness level in patients with heart failure. Additional studies utilizing a great number of subjects are required.

Oral

DOES WHOLE BODY VIBRATION COMBINED WITH ELECTROMYOSTIMULATION INCREASE BLOOD FLOW MORE THAN EACH TREATMENT ALONE?

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INTRODUCTION

Exercise and muscle contraction provide a powerful stimulus for vascular remodeling [1]. Endothelial cells are subjected to the shear stress resulting from blood flow and are able to convert mechanical stimuli into intracellular signals that affect cellular functions[2]. Whole body vibration (WBV) has been shown to produce increases in blood flow velocity [3] without significantly stressing the cardiovascular system [4]. Otherwise, low frequency electromyostimulation (ES)induces light muscle contractions responsible for a muscle pump effect that enhances muscle blood flow [5, 6]. However, to date, no study has shown the effect of the simultaneous application of both stimuli on blood flow. The aim of this study was to compare the acute effects of isolated and simultaneously application of WBV and ES on the popliteal blood flow in healthy subjects.

METHODS

Thirteen males were assessed in 5 different sessions. After a familiarization session subjects received 4 protocols (10 set x 1 min ON + 1 min OFF): WBV (V), ES (E), simultaneous WBVand ES (V+E), and 30s of WBV followed by 30s of ES (30´-30´).The subject was standing on the vibration platform(squat position,30° knee flexion, 26 Hz, 5 mm peak-to-peak), and ES was applied on the gastrocnemius of both legs (8 Hz, 400 μs).

RESULTS

A time* protocol effect was observed in both Mean Blood Velocity (MBV) ($p<0.001$; $\eta^2=0.324$) and Peak Blood Velocity (PBV) ($p<0.001$; $\eta^2=0.297$).During the application of each protocol, the average increment of PBV was 55.7%, 87.3%, 110.7% and 74.2% for V, E, V+E and 30'-30', respectively.

DISCUSSION

The simultaneously application of WBV and ES produced the greatest increase in MBV and PBV.Through increased efficiency shown, this protocol has an interesting practical application in cases in which WBV and ES was being used to produce vascular remodeling.

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EFFECT OF SET CONFIGURATION ON BLOOD PRESSURE DURING RESISTANCE EXERCISE

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INTRODUCTION

Resistance exercise produces a sudden increase in blood pressure (BP), so trainers should be careful when provide training in special populations. Many studies have shown that the length of the set determines the response of BP, with higher levels with each subsequent repetition and a peak occurring prior to muscular failure. In addition, larger rests between sets allow partial recuperation to previous BP values.

The aim of this study was to compare the effect of 3 lengths of the set with the same intensity and work-to-rest ratio on heart rate (HR), systolic (SBP) and diastolic (DBP) blood pressure.

METHODS

Ten students (23.9±2.51 yr; 1.75±0.07 m; 68.74±8.92 kg; HR: 57.78±9.62 bpm. SBP: 115.95±5.9 mmHg; DBP: 68.47±4.54 mmHg) were evaluated in 3 set configurations. 10 repetitions maximum (RM) was determined twice for leg press. In a counterbalanced design, subjects realized at maximal velocity a) 5 sets of 8 repetitions with 3 mins of rest between sets (8S). b) 10 sets of 4 repetitions with 1:20 mins of rest between sets (4S) and c) 40 sets of 1 repetition with 18 sec between each repetition (1S). All protocols had the same load (10RM load), volume (40 repetitions) and total rest (720 sec). HR, SBP and DBP were obtained beat-by-beat with an electrocardiogram and a photoplethysmograph, respectively (Task Force Monitor). Mean values were calculated for groups of 8 repetitions. 2-way repeated measures ANOVA (Session x Set) was used for all criterion variables ($p \leq 0.05$).

RESULTS

For SBP, a significant interaction was observed between Session and Set ($p=0.035$) with different patterns of increase depending on the protocol. No main effects were observed for the entire sessions for SBP (1S: 156.78±16.97; 4S 156.77±24; 8S 147.93±15 mmHg) nor for DBP (1S: 103.03±8.74; 4S: 103.53±14.4; 8S: 103.83±10.6 mmHg). For HR, a main effect for Session was observed, with lower values for 1S and 4S compared with 8S (101.92±13.27 vs. 107.68±11.16 vs. 125.03±12.37 bpm). Main effect of Set was significant for all variables.

DISCUSSION

Although mean values were similar between set configurations, the interaction between Session and Set for SBP indicates that differences between sets were dependent of set configuration. Previously, Baum et al. (1) reported a decrease in BP response by using rest interval between each repetition. However, similarly to the present study, Lammotte et al. (2) did not observe differences between protocols of different length and intensity, but with similar total work and rest. This suggests that the work-to-rest ratio has a key role in pressor response when a submaximal exercise is performed.

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Oral

EFFECTS OF DIAFRAGAMATIC ASPIRATION ON PHYSICAL AND BLOOD PARAMETRES OF PROFESSIONAL MOUNTAIN BIKERS

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INTRODUCTION

Diaphragmatic aspiration thecnique associated with expiratory apnea (1), called Hypopressive Thecnique (HT), has no evidence of it´s application on professional athletes. Scientific evidences suggests HT are aimed at rehabilitation of perineal pathologies (2) or spine pathologies (3). HT may reveal possible intermittent hypoxic changes in physiological parameters related to performance.

METHODS

Was designed a descriptive study with 4 professional mountain bikers of the Galician Center of Sports High Performance (age 15.25 years). Evaluation was performed before and after a 8-week HT protocol. The first month, 2 weekly 20-minute sessions of five hypopressive exercises were performed, then daily training was followed. Were assessed: body composition (Holtain caliper and Tanita BF522); hamstring extensibility with the sit and reach test; maximum oxygen consumption (VO2), with gas analyzer on a Cardgirus ciclosimulator. Finally, complete blood analysis was assesed in medical laboratory.

RESULTS

No significant changes were shown in the summation of folds, percent body fat and VO2 ($p>0.05$). However, marked improvement in hamstring extensibility and hematological values were described ($p<0.05$).

DISCUSSION

The present study describes changes on hemogram values. The literature shows how intermitent hypoxia training method appears to be beneficial to stimulate athlete´s erythropoiesis and result an increase of athlete's performance by better oxygen carrying capacity in the blood (4). Recently has shown an improvement of athletic performance with HT (5), in athetes whose oxygen saturation during HT training revealed intermittent hypoxic. Hamstring flexibility was increased. By contrast, there were no significant change in body composition perhaps due to the low energy cost of hypopressive exercises.

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ANALYSIS OF THE DETERMINING TRIPLE JUMP PERFORMANCE VARIABLES IN COMPETITIONS AT DIFFERENT AGES

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INTRODUCTION

In recent years, numerous biochemical analyses have been carried out on the triple jump, some of them in major international competitions.

However, there are very few studies that have analysed and compared athletes of other age categories, from 14 to 22 years of age, in competitions. This study aims to discover whether the determining triple jump variables are the same for different age categories.

METHODS

The finals of twelve 2013 indoor triple jump championships were analysed, in cadet (14 to 15 years of age), youth (16 to 17), juniors (18 to 19), under 23(20 to 22), and absolute category in Catalonia, as well as absolute category in Spain.

The sample consisted of 108 athletes (55 men and 53 women), whose best jump in each competition was selected for the study. The space was calibrated (runway and sandpit) and 5 Casio EX-F1 cameras were used: 2 recording at 300 fps and 3 which recorded at 30 fps and in HD. There were 3 Microgate Polifemo Radio photocells, at 1 m, 6 m and 11 m from the take off board and a Stalker ATS II radar. The data from 60 quantitative variables was obtained from each jump, referring to distance, time, speed and angle, during the phases of the approach run, takeoff, hop, step, jump and landing.

RESULTS

For the set of samples, the linear discriminant analysis shows significant relations between the official jump distance (dependent variable) and the velocity at which athletes enter the take off board ($p<0.000$), the length of the step ($p<0.01$) and the ratio of the step with respect to the total distance of the jump ($p<0.01$). Based on the most associated variables, a linear regression model was constructed for the set of participants. However, when analysing each championship separately, different variables were found that explain the official jump distance according to each age group, also obtaining different linear regression models per age group.

DISCUSSION

The variables that offer the best explanation of triple jump sports performance in a competition vary according to the sports training process of the jumpers, in other words, according to their age group. This could be used as a reference to establish the structure and distribution of physical and technical training content by age. Nevertheless, although two championships with the same determining variables were not found, there are two highly repeated characteristics: variables mainly referring to velocity appear and the most repeated one is the step ratio (%) with respect to the total jump distance. Although the step is the shortest of the three jumps, a higher ratio is correlated with best results ($p=0.004$).

Oral

EFFECTS OF WEIGHTED VEST ON KINEMATICS AND KINETICS DURING VERTICAL JUMP IN SOCCER PLAYERS

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INTRODUCTION

Training with weighted vests is a common resisted method to improve Jump performancein different sports such as soccer (4). However, little is known regarding the optimal load that must be usedand also about the acute effects produced by the load increase in kinetics and kinematicsvariables (2). The aim of this study was to explain the acute effects using weighted vests with different loads on variables of force, velocity, power and RFD of CMJ and Abalakov jump in soccer players.

METHODS

Eleven semi-professional male soccer players from 2nd B and 3rd division voluntarily participated in this study. Means and standard deviations of the characteristics of the participants were: age 23.1 ± 2.0 years, height 1.77 ± 4.0 m, body mass 71.8 ± 3.1 kg.Subjects performed prior familiarization of Abalakov and CMJ jump. Measurements were performed with VICON system synchronized to KISTLER platform.16 jumps were analyzed:4 under unloaded conditions (2 CMJ and2 Abalakovs) and 12 with increasing loads (5, 10 and 15% of body mass -Bm-). All loaded jumps were counterbalanced in order to minimize the effects of fatigue.

RESULTS

Significant differences were found in both CMJ and Abalakov, between 0% and 5, 10 and 15% of Bmin vertical jump height, take off velocityand relative peak power ($p \leq 0.05$). Also significant differences were found between two kind of jumps (CMJ and Abalakov), in vertical jump height (0.50 ± 0.04vs0.61 ± 0.06 m), relative peak power (6.22 ± 0.61 vs 7.28 ± 0.64 W/kg) and concentric RFD (48692 ± 7700 vs 53759 ± 7899 N/s) for unloaded conditions ($p \leq 0.001$).

DISCUSSION

Results from vertical jump height, take off velocity and relative peak power are according to the results obtained by Bosco et al., (1). In addition, Abalakov produces higher power levels, concentric RFD and jump height than CMJ. This is similar to results reported byHarman et al., (3). In conclusion, peaktake offvelocity and peak vertical power output with weighted vest in jumps is given when players jumping without any external load.

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VALIDITY AND RELIABILITY OF AN IPHONE APP TO MEASURE VERTICAL JUMP HEIGHT

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INTRODUCTION

Vertical jump performance is a key variable for several sports, and its measurement is widely used to evaluate lower limb power [1]. It has been demonstrated that a 240 frames per second (fps) high-speed camera can measure the flight time of vertical jumps in a valid, reliable way [2]. With the release of the iPhone 5s, which includes a 120fps high-speed camera, we wanted to know if such a device could measure the flight time of vertical jumps accurately.

METHODS

Twenty recreationally active male sport science students (age = 22.1± 3.6yrs.) performed 5 countermovement jumps, each one on a force platform working at 1.000Hz (Kistler 9287BA, Kistler Instruments Ltd., UK) while being recorded with an iPhone 5s at 120 fps. The flight times of the jumps on each video were calculated using an iPhone app that we developed for this study. Those flight times were compared with the flight times calculated from the force platform data. To analyze the validity and reliability of the iPhone 5s to measure the flight times in comparison with the force platform, we used the Pearson correlation coefficient and the intra-class correlation coefficient (two-way random effects, consistency). The level of significance was set at 0.05. All calculations were performed using IBM® SPSS® Statistics 22 (IBM Co., USA).

RESULTS

The Pearson's correlation coefficient shows a nearly perfect association between the flight times values of the iPhone 5s and the force platform (r=0.995, $p<0.001$). The intra-class correlation coefficient shows an almost perfect agreement between both the iPhone 5s and force platform flight times (ICC=0.998, CI=0.996-0.998, $p<0.001$). The mean difference between the iPhone 5s and the force platform flight times was 8.9±4.2 milliseconds.

CONCLUSIONS

The iPhone 5s using the app developed for this study can measure the flight times of vertical jumps in a valid, reliable, accurate, and economic way. These findings could help for coaches and trainers who wish to monitor the vertical jump ability of their athletes.

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Oral

EFFECTS OF A 32-WEEK MULTICOMPONENT TRAINING ON BODY COMPOSITION, STRENGTH AND BALANCE IN OLDER ADULTS

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INTRODUCTION

With the increasing of the population's lifespan and the knowledge of the importance of physical activity in later years, it is important to identify effective programs for older adults. Therefore, the purpose of the present study was to evaluate how age affects the responses on body composition, strength and dynamic balance to a 32-week multicomponent training (MT) in older adults.

METHODS

126 subjects were stratified in two age groups, the young-old group (YO, 60 – 70 years old) and the old group (O, >71 years old) and were randomly assigned to an exercise (EG) and a control group (CG). The EG completed aMT (3 sessions of 50 minutes per week). Body composition, isokinetic lower limb strength, and agility /dynamic balance were assessed at baseline and after 32 weeks. Three-way ANOVA with repeated measures was used.

RESULTS

No group differences were observed in baseline values, with the exception of the 8 foot Up and Go(UG) and trunk fat mass. After the 32 weeks, the YOEG decreased appendicular (11.84 ± 2.87 to 11.42 ± 2.75 kg), total fat mass (25.85 ± 6.50 to 25.05 ± 6.41 kg), improved total free-fat mass (42.25 ± 8.82 to 42.61 ± 8.89 kg) and right knee extension peak torque (49.27% ± 19.51 to 54.11% ± 18.82). Both YOEG and OEG showed a significant improvement in UG test score, and increased appendicular lean mass and knee flexion peak torque. The OCG increased the trunk fat mass (9.91 ± 3.88 to 10.52 ± 3.52 kg) and decreased total BMC (19.21 ± 4.83 to 18.73 ± 4.84 kg) and BMD (1.03 ± 0.14 to 1.01 ± 0.14 g cm^{-2}) after 32 weeks. No significant changes were observed in YOCG.

DISCUSSION

This study showed that 32 weeks of MT can produce significant changes in dynamic balance and in body composition- and strength-related variables and the rate of response was influenced by age, as the YOEG showed higher and better adaptations compared to the OEG. Physical activity is thought to decrease the skeletal muscle fat infiltration and muscle strength reduction that occurs with aging, consequently improving muscle quality (1), which corroborates the present results. Regarding bone mass, these findings are in accordance with previous data, which documented that age is an important predictor of BMD in older adults (2). Similar positive changes in dynamic balance have been shown in several other studies(e.g. 3).

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Oral

DETRAINING EFFECTS AFTER 8 WEEKS OF TRAINING CESSATION PERIOD IN A TRAINED GROUP OF ELDERLY

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INTRODUCTION

Exercise training for subjects over 65 should be applied to improve quality of life. However, physiological adaptations are transitory and disappear after training reduction or cessation (1)**.** Beside detraining exerts well known effects in young athletes, while limited information is available for elderly individuals. The aim of this study was to investigate the effects of 8 weeks of detraining in elderly subjects (age > 65 yrs), after 12 weeks of exercise prescription at vigorous intensity.

METHODS

17 healthy participants (69.3 ± 4.3 yrs) performed a randomized controlled trial on training program about 12 weeks at vigorous intensity (range 64-85% of Heart Rate Reserve) followed by 8 weeks of detraining. Before and after the training cessation period, subjects underwent an exercise test on a cycle Ergometer test until exhaustion to assess VO2max.

Heart Rate Recovery HRR, Waist-Hip ratio (WHR) and Body Mass Index (BMI) were also assessed. All the activities were monitored in real time by HR in Telemetry (Hosand) to maintain the %HRR and verified after training bout with an HRV test (MinicardioHosand). Paired t-test were used to compare the detraining effects on all variables before and after 8 detraining weeks.

RESULTS

VO2max decreased by 6,65% during the training cessation period (24.2 ± 4.7 to 22.6 ± 4.5 ml/kg/min p=0.32). However, BMI decreased by 5,3% (26.5 ± 3.5 to 25.1 ± 3.9 kg/m2 p = 0.24). Conversely HRR increased by 7% (62.1 ± 8.8 to 67.1 ± 9.2 bpm p=0. 15) these decrement were not significant. WHR increased significantly by 9% (0.92 ± 0.06 to 1.01 ± 0.09 $p<0.05$).

DISCUSSION

In the present investigation, after the training stoppage period following a vigorous training program, subjects were able to maintain a level of VO2max without a negative effect. Training exercise at vigorous intensity, instead of moderate intensity which is more commonly applied, was more positive also for BMI and HRR, otherwise The WHR were significantly different. Previous studies, employing moderate intensity (64% Heart Rate Reserve) showed higher tendencies to return back to the pre-training level during detraining. The Medical Doctors could consider also vigorous intensity exercise on the prescription (2) of physical exercise for elderly.

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Oral

INFLUENCE OF INTER-REPETITION REST ON MAINTAINING MAXIMUM LOWER LIMB MUSCULAR POWER AGAINST DIFFERENT OVERLOADS

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INTRODUCTION

Fatigue must be minimized when attempting to maximize power output (1).

One simple method to avoid fatigue is to perform low repetitions (reps) per set (2).

Another method that is gaining popularity in the last years is the Inter-Repetition Rest (IRR) training. IRR periods minimize muscle fatigue, enabling the performance of more reps per set before there is a significant power output loss (3).

Thus, the aim of this study is to determine the optimal range of reps to perform before it appears a significant power loss according to the pattern of movement (with or without rest between reps) and the load used (lower, optimal or higher than maximum power [P_{max}]) in half squat.

METHODS

16 active duty military men performed a progressive loading test to determine the load linked to P_{max} and 1-repetition maximum (1RM) in half squat exercise. The second day (48-72 h rest), they performed six maximal power output sets until a maximum of 20 reps with three loads: optimal load (OL), 15% lower (LL) and 15% higher (HL) respect to the load where P_{max} is attained. In a counterbalanced order, each subject performed one set without rest between repetitions (CR) and another set with 6 sec of rest between repetitions (IRR) with the 3 loads. Power output of each repetition was registered by a linear velocity transducer (T-Force, Murcia, Spain).

Only the first 12, 9 and 6 reps of LL, OL and HL, were analyzed.

RESULTS

Subject´s 1RM corresponded to 151.3 ± 19.5 kg and P_{max} was set at 67.0 ± 5.6% 1RM. When P_{mean} was expressed as a percentage of the best of the two initials reps, significant declines in relative P_{mean} were observed in CR protocol at the repetition 7 (p=0.004), 4 (p=0.002) and 3 (p=0.012) in LL, OL and HL, respectively. In contrast, for IRR significant declines were only observed in OL at rep 8 (p<0.001). When considering P_{mean} losses of 15% regarding the best of the two initials reps, athletes increased the number of reps per set in a 318% (11 vs 35 reps for LL), 186% (7 vs 13 reps for OL) and 275% (4 vs 11 reps for HL) in IRR.

DISCUSSION

Our results are similar to the ones found in previous studies, indicating that no more than 5 or 6 reps per set should be performed when considering P_{max} (1). However, when resting 6 sec between successive reps, the volume of sets may increase more than twice, maintaining the capacity to repeat maximal magnitudes power output. From our results, we conclude that IRR training may be a useful variable to consider when coaches design training programs for the development of muscular power. However, practitioners need to take into account that longer IRR periods may reduce post-exercise metabolic stress, compromising the gains in strength and muscle mass (3).

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YO-YO IR2 TESTING OF ELITE SOCCER PLAYERS: HEART RATE RESPONSE AND DIFFERENCES BETWEEN COMPETITIVE LEVELS

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INTRODUCTION

It's described that Scandinavian elite soccer players with better competitive level achieve a higher performance in the Yo-Yo Intermittent Recovery Test Level-2 (Yo-Yo IR2) (1). Further, Krustrup et al. 2006 showed that all these players were able to reach their maximum heart rate (HR_{max}) during this test. This, coupled with the fact that the Yo-Yo IR2 is the most widely used test to measure the intermittent performance level of soccer players, makes particularly interesting to verify if that happens in other professional soccer leagues. The aim of this study was to examine the intermittent performance level of elite soccer players of different categories in a professional soccer Club (Spanish League) using the Yo-Yo IR2, and to check if this test is useful to discriminate the competitive level of the players. It was also an objective, to test if all players achieved their HR_{max}regardless of competitive level

METHODS

For this study we recruited 102 soccer players from 6 age groups: Senior (Sr), Under 19 (U19), Under 18 (U18), Under 16 (U16), Under 15 (U15), Under 13 (U13). All of them performed a Yo-Yo IR2 (1) in which total distance was measured, and in which HRwas recorded (Polar Team 2). We compared the HR_{max} reached during the test with the estimated HR_{max}(220-age) (2).

RESULTS

Yo-Yo IR2 performance was, ordered from highest to lowest,1285.0 ± 310.8 m (U19), 1031.4 ± 167.7 m (Sr), 704.6 ± 106.5m (U16), 667.5 ± 102.0 m (U18), 550.6 ± 106.3 m (U15) and 542.2 ± 84.8 m (U13). U19 performance was significantly higher than Sr, and both were higher than the other age groups. U18 and U16 achieved a significantly higher performance than U15 and U13. The HR_{max}during the test was significantly lower than the estimatedHR_{max} (220-age) in all age groups.

DISCUSSION

Althoughdescribed byKrustrup et al. (1), the Yo-Yo IR2 testdoes not clearlydiscriminatethe different competitive levels ofour Spanish elitesoccer players. In addition, our results show that soccer players are unable to reach their estimated Hr_{max} (220-age).

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Oral

30-15 INTERMITTENT FITNESS TEST VS. YO-YO IR2: RELATIONSHIP AND ABILITY TO DISCRIMINATE PERFORMANCE LEVELS

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INTRODUCTION

The Yo-Yo Intermittent Recovery Test Level 2 (Yo-Yo IR2) is one of the most popular tests in soccer and examines the ability to perform repeated high-intensity exercise. Previous studies showed that Yo-Yo IR2 in elite athletes is higher than in non-elite athletes, and the test performance of 16-17-yr-old players was 30% lower than older elite players in the same club (1). The 30-15 Intermittent Fitness Test ($30\text{-}15_{IFT}$) asses high-intensity intermittent running capacity, and the final speed reached at the end of the test (V_{IFT}) can be used for high-intensity interval training prescription (2). The aim of the present study was to examine the relationship and the ability for both tests to discriminate performance levels.

METHODS

Sixty-nine soccer elite players and forty-three sub-elite players participate in the study. The protocols of Yo-Yo IR2 and $30\text{-}15_{IFT}$ test have been detailed previously (1,2). We reported the distance covered during the Yo-Yo IR2 and the maximal speed reached at the $30\text{-}15_{IFT}$. Heart rate (HR) was continuously measured to determine de HR_{max} at the end of the tests.

RESULTS

Significantly differences in the HR_{max} reached at exhaustion between $30\text{-}15_{IFT}$ and Yo-YoIR2 were found in elite and sub-elite U16 players, with higher values obtained during the $30\text{-}15_{IFT}$. There were no differences in the HR_{max} reached between teams in other age groups. The HR_{max} during both tests was significantly lower than the HR_{max} estimated (220-age). Elite U16 soccer players presented significantly higher V_{IFT} than sub-elite U16 players (20.4±0.6 *vs.* 18.9±1.3 $km.h^{-1}$, respectively), while there were no differences between teams in the Yo-Yo IR2 (627.7±135.2 *vs.* 674.7±164.8 m, respectively). There were small correlations between V_{IFT} and Yo-Yo IR2 (r = 0.26).

Elite U19 soccer players reflected significantly higher V_{IFT} and Yo-Yo IR2 than sub-elite U19 players (20.9±1.4 *vs.* 18.7±1.4 $km.h^{-1}$ and 1264.6±343.9 *vs.* 522.2±80.3 m, respectively). There were very-large correlations between V_{IFT} and Yo-Yo IR2 (m) (r = 0.84). Also, Elite senior soccer players showed significantly higher V_{IFT} and Yo-Yo IR2 than sub-elite senior players (21.1±0.8 *vs.* 19.6±1.1 $km.h^{-1}$ and 1084.0±150.2 *vs.* 522.2±106.7 m, respectively). There were very-large correlations between V_{IFT} and Yo-Yo IR2 (m) (r = 0.77).

DISCUSSION

In Senior and U19 both tests were able to discriminate elite and sub-elite soccer players. In U16 players, only $30\text{-}15_{IFT}$ reflected differences between performance levels showing higher HR_{max} than Yo-Yo IR2, maybe due to the neuromuscular load caused at this age by executing continuous COD at high speed.

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THE EFFECT OF POST EXERCISE COLD WATER IMMERSION ON ACCLIMATION TO EXERCISE IN THE HEAT

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INTRODUCTION

Previous research has shown that heat acclimation (HA) protocols conducted prior to arrival in a hot environment can improve exercise performance via physiological adaptations that improve heat tolerance. These beneficial adaptations include a lower rest and exercising core temperature (T_c) and heart rate (HR), an expanded plasma volume (PV), and an increase in sweat rate (SR). To produce a more rapid acclimation to the heat, the inclusion of exercise is a necessary component. However, if cold water immersion is used to assist in recovery from this exercise, it would seem counterproductive to HA given that each heat exposure may be followed by cold exposure. Therefore, the purpose of this study was to investigate the effect of CWI, used as a post-exercise recovery intervention, on the process by which humans adapt to HA.

METHODS

Eleven male subjects were randomly allocated to one of two groups: 1) cold water immersion (COLD; n = 6), where each HA session was followed by a CWI recovery (20 min; 14.4 ± 1.4°C), or 2) control (CON; n = 5), where each HA session was followed by a passive recovery in air (20.5 ± 1°C). All participants completed a $V.O_{2max}$ test, and a cycling performance test to exhaustion in the heat (34.8 ± 0.9°C temperature, 40.7 ± 8.6% humidity), immediately prior to and following a 6-day HA protocol that comprised 75 minutes of heat exposure per day and included 45 min cycling at 45% $V.O_{2max}$. Measurements were taken for T_c, HR, ΔPV, and ΔSR throughout each testing and HA session.

RESULTS

When expressed relative to baseline, HA was evident in both groups via lower mean exercising HR (126 ± 0.6 verses 141 ± 3.6 beats.min^{-1} for CON and COLD, respectively; P < 0.0001), an increase in SR during exercise (80.2 ± 0.4% verses 39.4 ± 0.1% for CON and COLD, respectively; P < 0.0001) and the expansion of PV (17.8 ± 11% verses 12.9 ± 6%, for CON and COLD, respectively; P < 0.05). However, following the 6-day HA period, exercise performance in the heat tended to be increased in CON only (42%; P = 0.06), in combination with a reduction in resting T_c (0.3°C; P < 0.05).

DISCUSSION

CWI as a method for recovery from training and competition is widely used by elite and sub-elite/recreational athletes to assist preparation for subsequent exercise. Although not unequivocal, the results of the present study suggest that CWI impacts on the physiological processes that lead to HA. Therefore, CWI should be used with caution during recovery from exercise undertaken whereby HA is a significant goal. Under such conditions, the mechanism underlying the attenuated increase in performance remains speculative. Therefore, future research should aim to clarify this response and shed more light on factors that may contribute to limiting the HA process before any clear recommendations can be made regarding the combined use of cold water immersion during a period of HA.

Oral

EFFECTS OF COMPRESSIVE GARMENTS ON THE RECOVERY FROM HIGH INTENSITY PLYOMETRICS

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INTRODUCTION

Compressive garments were originally used to treat deep thrombosis (1) and venous insufficiency (2,3). Subsequently, several authors have focuse don't he effect of compression in sport clothing, valuing its effect on resistance, strength and power, motor control, as well as different parameters, psychological, physiological and biomechanical; both during as post-efforts.

The objective of the study was to assesst he effect of compressive egarments in the processes of recovery of a high-intensity plyometric training.

METHODS

40 healthy students we reallocated in four groups: Control (no garments), M_rend (garments during training), M_recup (garments during recovery) and M_rend & recup (garments both in training and in recovery).We value the muscle fatigue during the 72 hours after this effort by using three types of test, counter movement jump (CMJ), squat jump (SJ) and repeated jumps (RJ).

RESULTS

Found a minor loss of power in M_rend & recup RJ with respect to group control in 1h, 24h, 48h and 72h after training ($p < 0.05$). There is a trend to a higher power in CMJ of M_Recup with respect to the control at 24 h ($p = 0.058$).

DISCUSSION

If the use of compressive garments improves more jump power with in hours to a maximum effort, it might have be nefits applied to sports training, optimizing the processes of recovery.

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MONITORING MECHANICAL PARAMETERS DURING SMALL SIDED GAMES

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INTRODUCTION

Soccer is a complex sport requiring the repetition of many different activities such as jogging, sprinting and jumping (1). It is essential to know how manage variables such as intensity, rest time or number of players in order to organize the well known "Small Sided Games" (SSG). Besides, the ability to sprint is a key parameter (2) and is the most frequent action in goal situations. In the review, we haven't found any research which relates specific SSG with simple mechanical parameters associated to fatigue neither the influence of repetition of this SSG sequences. Thus, the purpose of this study were: Firstly, to know the fatigue level produced by a SSG and investigate relationships between mechanical parameters related to jump and maximal sprint running before and after this specific situations.

METHODS

Sixteen trained soccer players performed a maximal sprint of 30-m before the specific SSG. Instantaneous running velocity (v in m·s-1) over time and distance was recorded with a radar Stalker ATS SystemTM. As well, a countermovement jump (CMJ) and a standing long jump (SLJ) were performed before the SSG.

The SSG was composed by 4 repetitions of: a straight sprint over 20-m (without ball), a change of direction and 20-m of 2-on-1 situation finishing with a shot. Immediately after the SSG, players performed a 30-m maximal sprint, CMJ and SLJ in order to check the decrease in performance.

RESULTS

CMJ height and SLJ performance loss pre-post SSG were highly significant and were strongly correlated ($r = 0.87$; $p<0.001$). The speed losses produced by the specific SSG presented a high relation with CMJ and SLJ exercises ($r = 0.78 – 0.89$; $p<0.001$). Besides, top speed and the moment which is achieved in the maximal sprint running significantly decreased ($p<0.001$).

DISCUSSION

High correlations found between mechanical responses (speed, CMJ height and SLJ performance losses) and the marked alterations observed in this study during a specific SSG, could be useful as indicators of fatigue. This could highlight the utility and validity of using CMJ and SLJ to monitor training load in different specific workouts, as has been proposed by Jiménez-Reyes et al (3). This data provides trainers a simple tool to monitor players fatigue and individual load which would then be used to design optimal training routines to improve players' training session.

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Oral

EFFECTS OF SMALL-SIDED GAME TRAINING ON VERTICAL JUMP IN FOOTBALL

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INTRODUCTION

A significant relationship has been observed between team averages for vertical jump performance and team success in football (1). The small-sided games (SSG) is a training method that include the ball in the physical fitness exercise played in reduced pitch areas (2). Most of the studies have included the SSG training program combined with normal football training, and it has been effective to improve physical fitness in football players during the preseason (3, 4). However, no studies have analyzed the effect of SSG training on vertical jump performance at the end of the season without combined with any other normal football training.

METHODS

Twenty two male participated in this study, 11 football players as the experimental group (20.4 ± 2.1 years; 71.8 ± 4.9 kg; 178.5 ± 5.4 cm, mean ± SEM, and eleven physical education students as the control group (21.5 ± 1.2 years; 75.9 ± 5.9 kg; 177.3 ± 5.8 cm). The experimental group trained during nine weeks, two sessions per week, with SSG training. The vertical jump was measured using a force platform (Kistler, Winterthur, Switzeland. The subjects performed 3 maximal squat jump (SJ) before and after the training program. During the jumps, the subjects were asked to keep their hands on the hips and to minimize horizontal and lateral displacement. The height jumped reached was determined in the best of the three trials for SJ, the best of them was used to represent the result in the vertical jump performance. Significant level were established at $p<0.05$.

RESULTS

There were no significant different between groups in vertical jump performance after SSG training. The squat jump height (m) before and after for the experimental group were (0,62±0,08, 0,64±0,12, respectively) and for the control group (0,61±0,11, 0,62±0.06 respectively).

DISCUSSION

Nine weeks of small-sided games at the end of the season did no improve the vertical performance in football players. Further studies could improve our understanding on how to best design of SSG in order to improve the vertical jump performance.

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Oral

COMPARISON OF THE EXTERNAL LOAD IN 4-4-2 AND 4-3-3 TACTICAL SYSTEMS IN HIGH LEVEL SOCCER PLAYERS MEASURED WITH GPS DEVICES

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INTRODUCTION

Each tactical system organizes players with specific roles. Therefore, the aim of the study was to determine if the external load is different in two tactical systems (TS) used during the preseason matches in elite soccer team, measured with GPS devices.

METHODS

21 male players (20.9±1.7 years; 1.80±0.05 m; 73.1±5.3 kg) from the Athletic Club of Bilbao belonging to the 2nd division B participated in this study. Written informed consent was received from all players. The Ethics Committee of the UPV/EHU approved this study. External load were measured using a GPS system. During the pre-season 9 matches were evaluated (season 2012-13). Two tactical systems were analyzed: 4-4-2 system *vs.* 4-3-3 system. Moreover, data was analyzed in the five positions[1]. Different TS were used in each period of the matches. In each period the following variables were measured:total distance covered, average and maximum speed and intensity of the game: distance covered at 14-21 km/h (moderate-speed running); 21-24 km/h (high-speed running); >24 km/h (sprinting), as well as, the running velocity at high intensity (sum of the last three)[2]. Means, standard deviations were calculated. U-Mann Whitney was performed using SPSS (v20). The level of significance was set at $p < 0.05$.

RESULTS

According to the TS, the running distance at high intensity in the 4-4-2 system was significantly higher (p=0.044) than in the 4-3-3 (1046.19±247.35 *vs.* 960.64±247.92 m, respectively). Regarding the playing positions, the distance, high intensity and moderate-speed running covered and the average speed by forwards in the 4-4-2 system were significantly higher ($p<0.005$) than in the 4-3-3 system (5070.42±247.07 *vs.*4732.2±266.8 m; 1199.78±83.02 *vs.* 956.94±107.32 m; 915.55±73.14 *vs.* 725.69±107.94 m and 6.48±0.29 *vs.* 6.0±0.30 km/h, respectively).

DISCUSSION

Both TS are categorized as systems of possession, but the obtained results showthat the 4-4-2 system requires greater intensity. Therefore, the choice of the system could affect player's performance, which may affect the ability of task resolution due to fatigue. Furthermore, it seems that TS that keep the playing positions together require a lower intensity to perform the tactical roles. In addition, despite the differences in the positioning of the players in both TS, no differences were found in the midfield, wing-midfield and defense players. With these data, the coach may choose the type of TS according to the profile and physical fitness of the players.

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Oral

BASKETBALL PERFORMANCE INDICATORS DURING THE ACB REGULAR SEASON FROM 2003 TO 2013

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INTRODUCTION

In basketball, the use of performance analysis is an essential tool to obtain information about the opponents and/or your own players (1). Besides, the game-related statistics are very useful for basketball researchers in order to improve the understanding of this game (1,2). The main goal of the present study was to identify basketball game performance indicators which best explain the total number of victories during the regular season of the Spanish Basketball League (ACB). A second purpose was to determine game related indicators that differ among basketball teams qualified for the playoffs, teams non-qualified for the playoffs and teams that lost their ACB category.

METHODS

The study sample consisted of all male basketball teams that participated in the ACB regular season from 2003-2013. Game-related statistics for each team during the whole year were obtained from the ACB website. Pearson's correlation coefficients were used to assess the association between game-related statistics and the number of victories. A multiple regression analysis was also performed to assess the variance in the number of victories explained by the game-related statistics. One-way analyses of variance was used to determine the differences among teams qualified for the playoffs, teams non-qualified for the playoffs and the teams that lost their ACB category.

RESULTS

The percentage of successful 2 points field-goals (r = 0.66) and the total number of assists (r = 0.59) were the variables that better correlated to the number of victories during the regular season. The regression analysis that explained the highest variance of the number of victories during the regular season (r^2 = 0.76) included precision indicators (percentage of successful free throws and 2 and 3-point field-goals, 26% of variance explained), the total number of rebounds (defensive and offensive, 23%), the number of steals (9%), turnovers (7%), assists (6%) and the number of received blocks (6%).

The basketball teams that qualified for the playoffs obtained a higher percentage of successful 2 points field-goals, a greater number of assists and a lower number of received blocks during the regular season in comparison to the remaining teams ($p<0.05$). The last two teams qualified to the end of the regular season obtained lower percentages of successful throws (free throws, 2 and 3-point field-goals) and a lower number of assists than the other teams ($p<0.05$).

DISCUSSION

The percentage of successes in all kind of throws and the total number of assists were game indicators most related to the number of victories suggesting that precision during field throws and the number of assists are the best predictors of elite basketball performance. This information may help basketball coaches to design specific training programs to improve the variables most related to the victory.

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STRENGTH OR TECHNIQUE: WHAT SHOULD BE TRAINED TO INCREASE SWIMMING SPEED?

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INTRODUCTION

Swimming speed is both dependent on strength and technique. Indeed, the balance between these two major factors may explain the success or failure in competitive events. However, competitive events vary enormously in terms of distance, and therefore time and intensity. Thus, an optimal level of strength is essential for successful performance in swimming (1), varying according to the distance to be swam (2). But how can swimming coaches track the balance between these two factors? And how can be identified if the swimmer must focus in one of them, in detriment of the other?

METHODS

Twelve male and eleven female swimmers, with a minimum of 2-years' experience in resistance training, took part in acorrelational explanatory design. Participants performed 3 maximal front crawl bouts tethered to the starting block (one bout with no constrains, one using only arms and one using only legs). A load-cell was used to assess instantaneous force-time curves. Mean values were estimated for each bout and correlated with swimming 100-m freestyle personal best.

RESULTS

All participants, except two female swimmers, obtained lower mean forces swimming with no constrains than the sum of mean forces with constrains. In male swimmers sum of forces with only arms and only legs presented higher correlation with swimming performance (r=-0.703; p=0.011) than forces with no constraints (r=-0.525; p=0.080). In female swimmers forces measured with no constrains presented a higher correlation with swimming performance (r=-0.780; p=0.005).

DISCUSSION

Whereas the ability to use the muscle force output effectively in water is more important than the levels of strength (1), the relationship between exerted forces in water with swimming speed may provide an appropriate tool for specific evaluation. Moreover, the measurement of the forces exerted with arms and legs separately can provide a diagnostic tool for evaluation of strength deficits. Theoretically, it would be expected that the combination of the upper and lower limbs in a synchronized manner could generate a small amount of additional force exerted. Thus, the sum of the forces exerted by the arms and legs would be lower than those performed with the full body, which did not occur. For male swimmers the sum of the forces of the arms and legs showed a higher correlation with performance, suggesting that this group should give greater emphasis to technical training in order to be able to increase their ability to effectively use the muscle force output in the water. In contrast, female swimmers seem to have a greater margin of progression in strength training.

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Oral

HIGH INTENSITY INTERVAL TRAINING IN PATIENTS WITH TYPE 2 DIABETES: DIABETES EM MOVIMENTO® TRIAL

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INTRODUCTION

High intensity interval training (HIIT) has been recently recognized to improve health outcomes in non-athletes population and its generating a new interest in the reduction of cardiometabolic risk factors.[1] This study aimed to analyze the acute effects of a single bout of HIIT in blood glucose levels in patients with type 2 diabetes.

METHODS

Fifteen individuals with type 2 diabetes (diagnosed at 5.33 ± 2.31 years; eight women and seven men; age 60.25 ± 3.14 years; glycated hemoglobin 7.03 ± 0.33 %, treated with oral hypoglycemic agents) participated in a randomized controlled crossover study. Study sample underwent a single bout of HIIT and a control session of seated rest during standardized breakfast postprandial state, with one week apart and in random order. HIIT was conducted in a treadmill and consisted in a 5-min walking warm-up followed by 5 series of 3-min brisk walking at 70% of heart rate reserve (HRR), interspersed with 3-min at 30% HRR, followed by a 5-min walking cool-down, totaling a 40-min exercise session. Capillary blood glucose was measured before sessions, immediately after sessions, after 50-min laboratory recovery, before lunch, before mid-afternoon snack, before dinner, before bedtime and in next morning fasting sate.

RESULTS

Two-way ANOVA (condition*time) identified a significant effect of condition*time interaction on glycemia levels ($p < 0.001$). After exercise start, blood glucose levels were always lower compared to control, with significant differences at the end of exercise (81.33 ± 18.00 vs. 124.17 ± 29.94 mg/dl, $p < 0.001$), at the end of the 50-min laboratory recovery (85.50 ± 11.00 vs. 97.75 ± 25.06 mg/dl, $p = 0.037$) and before dinner (108.17 ± 14.08 vs. 119.00 ± 19.48 mg/dl, $p = 0.022$).

DISCUSSION

Acute control of blood glucose levels is crucial to reduce the risk of micro and macrovascular complications of diabetes. HIIT seems to have a positive effect in acute glycemic control in patients with type 2 diabetes, either in laboratory conditions either in free living conditions. *_ENREF_2_ENREF_1_ENREF_2* This type of exercise protocol can be safely applied in community-based exercise programs[2] designed for diabetic population if special attention is given to the prevention of exercise-related injuries and adverse events.[3]

FINANCIAL SUPPORT

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HIGH INTENSITY RESISTANCE TRAINING ADAPTATION ON STRENGTH, BODY COMPOSITION AND AEROBIC CAPACITY IN SEDENTARY INDIVIDUALS

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INTRODUCTION

In the last years Resistance Training (RT) has been incorporated in the common Guide Lines as an important component of physical exercise (ACSM 2011). Numerous studies have demonstrated that RT could improve muscular strength and also aerobic capacity (Petersen 1989; Keller 2001); but a varied range of different exercise executions composes RT, and the combination of these variables could influence in a different way the adaptive response to training (Paoli 2012). One of the main variable of RT is intensity (load given/duration of exercise). High Intensity Interval Resistance Training (HIRT) is a resistance training program that consist in performing few repetition with high load with a very short rest between sets. The aim of this study was to compare the effects of HIRT and Traditional low-intensity Training (TT) on muscular strength, body composition and aerobic capacity.

METHODS

20 healthy young volunteers (age: 22.2±2.0 years; BMI: 23.6±1.6) trained for 2 month, 3 times a week. Training protocol consisted of one exercise for major muscle groups. DEXA analysis, maximal incremental exercise test on a cycle ergometer, and 1 repetition maximum (1RM) were investigated before and after 8 weeks of training.

RESULTS

Both groups increased their strength on all exercise, whereas the HIRT group improved more than TT (36% vs 24%). Exercise duration on the cycle ergometer improved for both groups without any group-by-training interaction. Only in TT group the work rate increased significantly (+5.3%). VO_2 increased in both groups with no significant differences between training; no significant alterations were found for other aerobic variables measured. Body composition analysis shown a significant greater improvement of body fat (-1.8%) in TT whilst a significant greater increase in lean mass (+3%) in HIRT.

DISCUSSION

Both training protocols produced a significant improvement in strength and aerobic capacity during a8-week training period;while the HIRT protocol produced better gains in muscular hypertrophy, TT protocol seems to have better improvement on body composition and short-term endurance. RT intensity seems not to influence aerobic capacity after 8 week of training but it could be an important factor influencing muscular strength and body composition.

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Oral

LOWER LIMBS ISOMETRIC STRENGTH AND BONE FRACTURE INDEXES IN ADOLESCENTS WITH DOWN SYNDROME

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INTRODUCTION

Measurement of leg extension strength is a non-invasive test that might provide interesting information regarding muscle and/or bone mass; factors closely associated with present and future health.Adolescents with Down syndrome(DS) are characterized by lower levels of bone mass than their non-DS peers, and higher fracture risk(1). Whether these two factors are also related in a DS population would be interesting to know in order to screen them before an invasive X-ray assessment is carried out. Therefore, the aim of the present study was to describe, if it does exist,arelationship between muscular strength and bone strengthindexes at the lower limbs in adolescents with DS.

METHODS

Twenty-four adolescents with DS (8 girls) participated in the study.Peripheral quantitative computed tomography(pQCT) measurements were taken at 38% of the tibia length;stress strain index(SSI) and resistance to fracture load(FRC_LD) in X and Y axis, bone strength index(BSI) and polar strength strain index(SSIPol), were calculated from this mesurement. Maximal isometric strength(MIS, kg) of the legmuscles was measured using a strain gauge attached to the wall with a chain mounted and an adapted anchorage attached to the distal third of the leg.Pearson´s bivariate correlations were applied between MIS and the different bone parameters in the whole sample, and alsospliting by gender.

RESULTS

Analysingas a whole group, all bone-related variables had a medium to strongcorrelation with MIS (from r=0.54to$r$=0.64; all $p<0.05$). Analysing by gender, no correlations were found forDS girls in any variable, while stronger correlations were found in the boys group between bone parameters and MIS (ranged from r=0.63to$r$=0.76; all $p<0.05$).

CONCLUSION

The use of a MIStest in the lower limbsof adolescents with DS, specially in males, might be a good screening to determinate the relative risk of fracture, and therefore the need to undertake a X-ray scan or another invasive imaging techinque for determinating this.

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SPANISH JUNIOR SWIMMING TEAM: LEGS STRENGTH-POWER AND ITS RELATION WITH SWIMMING PERFORMANCE

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INTRODUCTION

Swimming races are divided into different phases: start(ST), swim (SW), turn (TR) and finish (F) where the swimmer performs specific skills that must beindependentlyevaluated (1). Several authors have studied the relationship between the swimming phases and the strength-power performance (2). The junior athletes have different maturity levels as well as different needs. In addition, their changes in performance may occur more quickly thanin senior athletes, so they should be periodically evaluated to trainaccordingly. We aim to describe the swimming phases and the squat jump performance(SJ) as well asto study the relationship between them, in a group of international junior swimmers.

METHODS

19male swimmers (age: 16.4 ± 0.9 years),from the Spanishnational junior team, were tested alongthree consecutive days.On the second day, a "50m + turn" (15m) freestyle test was performed in order to get the main kinematic variables obtained in the standard competition analysis. Nine cameras (50Hz) set perpendicularly to swimmer'sdisplacement recorded the trials. A specific Filemaker-Quicktimescript was used for the temporal analysis. On day1 and 3,the swimmers, randomly divided in two groups, performed a SJ protocol test.They performed one unloaded jump(0%) and four more with the 25%, 50%, 75% and 100% of their body weight. Peak velocity (V)was registered by a linear velocity transducer(T-Force, Spain). Height of the jumps(H) was estimated byOptogait System(Microgate, Italy).

RESULTS

The times (s) obtained were: ST10m: 4.07±0.21; ST15m: 6.86±0.30; SW15-45m: 17.76±0.57; TR45-65m: 11.63±0.42. H decreased due to the load increase. H0%: 29.56 ± 3.88; H25%: 21.25 ± 3.09; H50%: 15.36 ± 2.53; H75%: 11.84 ± 1.94; H100%: 7.11 ± 1.85.The same pattern was observed in the V, V0%: 3 ± 0.3; V25%: 2.58 ± 0.16; V50%: 2.25 ± 0.14; V75%: 1.99 ± 0.13; V100%: 1.73 ± 0.12.We found that ST10m and ST15m were significantly correlated ($p \leq 0.05$) with H and Vin the five sets of SJ. Correlations reached r=-0.743 between ST10m and H25%. SW15-45m only showed correlation with V50% ($p \leq 0.05$, r = -0.509). No significant correlation was found for the turning times.

DISCUSSION

The relationbetween the strongest and the fastest swimmers seems to be more evident in the starts'performance. Similar results has been recently observed (2). This study presents some reference values as well as significant relationships between conditional variables and swimming performance. These findings may help coaches in the performance assessment, the talent identification and/or the setting of new goals.

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Oral

THREE-DIMENSIONAL ANALYSIS OF GRAB- AND TRACK-START IN THAILAND SWIM TEAM: A CASE STUDY

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INTRODUCTION

The ability to perform different technical tasks is critical forswimming performance. Knowing that starting is a very important technical domain for swimming performance (Hay,1986), we aimed to kinematically characterize and compare the grab- and track-start techniques performed by a Thai top swimmer using a three-dimensional analysis.

METHOD

A 15-y-old female breaststroke swimmer from the Thailand National Team (54kg of body mass, 174cm of height, and 73.1s as best performance in 100m breaststroke long course- 86.40 % of World Record) volunteered to perform a grab- and a track-start as in competition conditions. Eight stationary Oqus high speed motion capture cameras (500 Hz and 1/120s of shutter speed) werepositioned tocapturethemovements of theswimmer (xz - sagittal plane, yz - frontal plane, xy - transverse plane). Qualisys QTM Software was used for all data assessments.The kinematical analysis focused on block leaving, flight and entry phases, evaluating a total of 16 parameters.

RESULTS

Track-start technique showed a shorter total time from block to full body entry than grab-start technique (1.31 vs. 1.44s) due to the shorter time spent to leave the block (0.64 vs. 0.84s), similar flight time (0.37 vs. 0.37s) and lowertime in water entry (0.30 vs. 0.23s). The angle of take–off in grab-start was smaller than in track-start technique (34.49 vs. 41.73 º), with higher segment velocity than track-start in sagittal plane (xz) of the center of gravity at takeoff (3.99 vs. 3.33m·s^{-1}), head movement (4.25 vs. 3.27m·s^{-1}), hand movement (6.24 vs. 5.40m·s^{-1}) and transverse plane (xy) of knee movement (2.41 vs. 1.58m·s^{-1}), respectively. The lower angle of entry in the track-start in relation to the grab-start (19.90 vs. 30.30º) was partly related to the velocity of the center of gravity at the beginning of entry tends to be higher (3.82 vs. 3.46 m·s^{-1}).

DISCUSSION

Current data evidenced thattrack start techniquewas faster than grab-start probably due to the lower time period spent in the starting block. Themain differences noticed between the two start techniques seems to be related to the angle of take-off and beginning of entry, as it isdirectly related to velocity of body segments of flight phase and flight time.

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ACUTE EFFECT OF STRENGTH TRAINING WITH ECCENTRIC OVERLOAD ON KINETIC PARAMETERS ASSOCIATED DURING SIDECUTTING

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INTRODUCTION

Strength training with eccentric overload is frequently used in team sports as a strategy for muscle injury prevention (1). In several studies it has been observed an acute proprioceptive impairment as a result of the use of these eccentric actions (2,3). In this sense, the main aim of this study was to analyze the acute effects of strength training with eccentric overload on different kinetic parameters associated with a change of direction task.

METHODS

Twenty players under 19 belonging to a professional football team (age = 17 ± 1 years, height = 178.11 ± 2.34 cm, weight = 71.76 ± 4.56 kg, BMI = 19.12 ± 2.45 kg · m^{-2}) were involved in the study. Subjects were randomized to one of three interventions separated between 72-96 h: a) standardized warm-up with cycle ergometer (CON), b) strength training with maximum power load (Pmax) and eccentric overload using a Yo-Yo leg curl machine (EXP-H) and c) strength training at Pmax and eccentric overload using a Yo-Yo squat machine (EXP-Q). A 20 m sprint test was performed after each intervention. Each trial finished with a change of direction at an angle of 45º (opposite to the support leg) on a force platform. Outcome measures analyzed were as follows: peak vertical force (GRVF), force moments in the medial-lateral (Mx) and antero -posterior (My) axes and support time (ST).

RESULTS

A significant interaction for ST ($p < 0.05$) was observed when EXP-H was compared to CON.

DISCUSSION

Strength training with eccentric overload at Pmax performing squat and leg curl exercises does not cause a change in the kinetic parameters associated with a change in direction. According this response, training load used didn't elicitan acute proprioceptive impairment, as proposed by other authors (2,3). Moreover, a lower ST time following the EXP-H treatment was observed. There are numerous mechanisms potentially responsible for this response exhibited. The possibility exists that the EXP-H treatment was effective in eliciting a post activation potentiation (PAP) response, an increase in the contractile ability of muscle following a bout of previous contractions (4).

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Oral

THE EFFECTS OF A CONCURRENT STRENGTH AND ENDURANCE TRAINING ON ENDURANCE AND MUSCLE STRENGTH IN SOCCER PLAYERS

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INTRODUCTION

The optimal development of cardiovascular and neuromuscular characteristics of soccer players requires the combination of endurance and strength training programs. Previous studies have examined the effects of various concurrent endurance and strength training programs on endurance, muscle strength, peak torque, vertical jump ability, sprint performance, and flexibility in various athletes (Gorostiaga et al., 1999; 2004; Bishop et al., 1999; Paavolainen et al., 1999). A number of studies suggested that a concurrent training may interfere with strength (Kraemer et al., 1995) or endurance (Glowacki et al., 2004) improvement, whereas other studies do not support these inhibitions (Gorostiaga et al., 2004; Paavolainen et al., 1999) when a resistance and endurance performed simultaneously. The purpose of this study was to compare the effects of an 8-week endurance training and concurrent strength and endurance training program on endurance and neuromuscular performance in young soccer players.

METHODS

Twenty-seven young soccer players, aged 17-19 years, were assigned to one of two groups: concurrent strength and endurance training (CT; n=14), and endurance training (ET; n=13). Both groups were evaluated in the 1-RM squat muscle strength, peak torque of knee extensors at 180°/sec, running velocity at the fixed blood lactate concentration of 4mmol/l (V-4mM), squat jump (SJ) and countermovement jump (CMJ) height, and 30m sprint time before and after the 8-wk training period. Both groups performed every week five soccer training sessions and a soccer match. Concurrent and endurance training programs were parts of the soccer training sessions. The ET performed interval training two times per week, Tuesday and Friday. The interval soccer training consisted of four 4–min at an exercise intensity between 90-95% of maximal heart rate for each player with 2-min passive rest was performed between exercise bouts. The CT group performed the strength and endurance training programs in two consecutive days. The strength training program consisted of half squat exercise and was intended to provide a stimulus for the muscles of the lower limbs. The first four weeks, CT performed 3 sets of 6-8 repetitions, whereas from the fifth week until the end of the resistance training participants performed 4 sets of 4-6 repetitions. Loads were increased when participants were able to perform more than the targeted number of repetitions with the current workload. After the half squat exercises, CT group performed 3 sets of 5 repetitions maximal vertical jumps, and 3 sets of 4 repetitions sprints (10-40m). The total duration of the strength training did not exhibit the 30 min.

RESULTS

Both CT and ET groups increased significantly ($p < 0.001$) the V-4mM after the training period, by 13% and 16%, respectively. CT improved significantly ($p < 0.001$) the 1-RM squat strength (9%), peak torque of knee extensors (5%), SJ height (9%), CMJ height (8%), and 30m sprint time (2.7%), whereas no changes were observed in ET group.

DISCUSSION

These data suggest that there is not an interfere phenomenon between the present strength and endurance training programs. Previous studies have used explosive or heavy strength training programs combined with endurance training, with various results (Gorostiaga et al., 1999; 2004; Paavolainen et al., 1999). Muscle strength is an important component for improving the physical and technical performance in soccer (Kalapotharakos et al., 2006). The enhancement of 1-RM muscle strength and peak torque of knee extensors at 180°/sec after the concurrent training is due to the strength training program. Force increments through a short term heavy resistance training are attributed primarily to neural mechanisms (control, coordination, motor activation), while morphological (hypertrophy) adaptations of neuromuscular function follow (Kalapotharakos et al., 2004).

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ORAL

A COMPARISON OF PHYSICAL CHARACTERISTICS AND ABILITIES BETWEEN SERBIAN PROFESSIONAL VOLLEYBALL PLAYERS AND YOUNG PLAYERS (AGE 16-18 YEARS OLD) AT AN INTERNATIONAL VOLLEYBALL CAMP

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INTRODUCTION

The purpose of this study was to investigate physical characteristics of professional Serbian players and young players and compare these two groups. The evaluation of present practices through research conduction can be used to develop better training programs suited to the needs of the competitive player (1).

METHODS

Fifty young players, (N = 50 males, between 16 to 18 years old) as group 1 (G1), and 16 professional volleyball players (N = 16 male, between 18 to 36 years old) as group 2 (G2) participated in this study. The test battery was designed to measure maximal muscular functional performance in this discipline. It consists of the following measurements: weight, height, standing reach for smash and block, flexibility, long jump, jump reach in smash, reach in block without arm swing, reach in block with arm swing, number of sit-up repetitions in 30 sec., agility (5m), 10m sprint. (2)

RESULTS

Weight (G1=70.0 ± 9.7 kg; G2=88.6 ± 7.8 kg) BMI (G1=21.5 ± 2.2 kg/m2; G2=23.9 ± 1.0 kg/m2). Height (G1=180.1 ± 8.2 cm; G2=192.5 ± 6.9 cm) Standing reach in smash (G1=235.6 ± 11.2 cm; G2=252.9 ± 9.0 cm) Standing reach in block (G1=232.3 ± 10.9 cm; G2=248.3 ± 8.7 cm) Reach in smash (G1=289.6 ± 18.6 cm; G2=324.4 ± 6.6 cm) Reach in block without arm swing (G1=272.7 ± 15.2 cm; G2=302.1 ± 7.6 cm), and Reach in block with arm swing (G1=276.1 ± 15.1 cm; G2=304.7 ± 7.4 cm) Jump height during smash (G1=53.8 ± 10.7 cm; G2=71.5 ± 8.1) Jump height during block with arm swing (G1=43.7 ± 7.6 cm; G2=56.4 ± 7.2 cm) Jump height during block without arm swing (G1=40.4 ± 7.7 cm; G2=53.9 ± 6.5 cm) Long jump (G1=213.1 ± 29.3 cm; G2=264.9 ± 22.2 cm) Flexibility (G1= -7.5 ± 9.2 cm; G2= -16.5 ± 13.9 cm) Abs - (G1=29.7 ± 4 reps; G2=36.7 ± 2.4 reps) Agility - (G1=11.8 ± 1.2 times; G2=14.0 ± 0.6 times) Speed - (G1=2.3 ± 0.2 sec; G1=1.8 ± 0.2 sec)

DISCUSSION

The data analysis reveled no significant difference between young players and professional players in variables like weight, BMI, standing reach in smash, standing reach in block, reach in smash, reach in block without arm swing and with arm swing, jump height during smash, long jump, flexibility, repetitive abs power and agility. Only have been found significant differences about height measurements, jump height during block with and without arm swing and sprint on 10m. We think that differences come because of selected athletes (professionals) during their growing period, better block technique, specific longer and better physical preparation and age.

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Oral

VELOCITY-BASED VS TRADITIONAL STRENGHT TRAINING IN PROFESSIONAL SOCCER PLAYERS

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INTRODUCTION

Sprints, jumps and kicking are considered relevant factors for successful performance and widely related to strength (1). Traditionally, the training protocols used for increasing strength training consisted in a set of exercises in which athletes lifted heavy weights (nearly 1RM) with difficulties for considering the real effort of athletes. However, several authors have stressed the importance of movement velocity in the prescription and control of resistance training (2, 3), establishing for some exercises that by measuring movement velocity it is possible to determine the %1RM and real effort. Considering the aforementioned above strength programming training, the main purpose of this study was to investigate the effects of using a traditional strength training (TST) with a fixed intensity and a velocity-based strength training (VST) monitoring real intensity in professional Spanish soccer players

METHODS

Eighty professional soccer players (four teams) took part in the study (24.4 ±5.21 yr, body mass 73±4.6 kg, height 177.4 ± 5.4 cm, body fat 9.3±2.3%), who play in the Spanish first and second division leagues were distributed in a TST and VST groups, doing a personalized and individualized training (twice weekly; 6RM, and 1m · s^{-1} movement velocity and 20cm in CMJ for TST and VST, respectively). Four teams were evaluated at the beginning of the competitive period, and at the end of the first half of the regular season. The following were evaluated: the strength of the lower extremities by CMJ, CMJ loaded until the jump height was around 20 cm (CMJ_{20cm}) and full squat until the execution speed was 1m · s^{-1} (Sq_{1ms}) and the sprint time 20 meters.

RESULTS

CMJ and Sq_{1ms} performances improved significantly for TST and VST groups, respectively ($p<0.05$; $p<0.001$) showing a surprisingly higher improvement in the VST (12%; $p<0.001$; effect size (ES) of 1.24 in CMJ; 14%; $p<0.001$; ES of 1.37 in Sq_{1ms}) compared to the TST (4%; $p<0.05$; ES of 0.49 in CMJ; 7%; $p<0.05$; ES of 0.73 in Sq_{1ms}). For CMJ_{20cm} and 20-m sprint only the VST improved significantly (15%; $p<0.001$; ES of 1.98 in CMJ_{20cm}; 5%; $p<0.05$; ES of 0.61 in 20-m sprint).

DISCUSSION

These findings indicate that VST produces better physical performance effects than TST and a specific improvement in power output related patterns, suggesting that this methodology is more adequate for strength improvement for in-season training in professional soccer.

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INCREMENT OF STRENGTH AND MUSCULAR POWER IN THE SCHOOL CONTEXT

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INTRODUCTION

Studies related to strength trainability in young people continue to be limited, especially when it relates to school environments. But from a scientific point of view children and adolescents can increase their muscular strength beyond normal growth when they participate in an adequate training programme with intensity, volume and duration(Faigenbaum and Myer, 2010; Faigenbaum, 2011). The main aims of this study are to analyze: (i) if motor capacity strength and muscular power, in general, improve in the school context and (ii) if the implementation of a strength training programme has greater gains than in normal physical educationalclasses(PE).

METHODS

The studyinvolved two groupsof 10th graders from Pereirade Melo secondary school, Porto. It consisted of 15female participants who wereallocated to two groups: a control groupwith 8students andan experimental group with 7students. The process implied the execution of the following teststo assessmuscle strength and muscular power: 60" push-ups, 30"curl-ups, 2kg medicinal ball (MB) throws,static horizontal jumps, sextuple jumpsand 50m runs. Thestrength trainingprogrammeconsisted of a set of exercises with short dumbbells: calf raises,lunges, half squats, bench press, butterfly, vertical row,abdominal and lower back(2 sets of 10-15 repetitions at ca. 60% 1RM). These exercises were carried out twice weekly and thetraining program lasted6 weeks.

RESULTS AND DISCUSSION

In the experimental group, the gains are statistically significant inpush-ups, suspension, 2kg MB throw, sextuple horizontal jumps (26,6%, 7,9% , 9,7%, 4,8% and7,6% respectively) however the control group also had significant improvement in throwing the MB and sextuple jumps (3,5% and 5,5% respectively), which were evidenced in the non-parametric statistics in the Wilcoxon test. This may suggest that normal PE classes and maturation can induce enhancement in physical performance. Although the experimental group showed better changes in all the tests, only in the static horizontal jumps did it have sufficiently greater/robust gains which statistically differentiate it from the control group (p=0.032, Mann-Whitney test).

CONCLUSION

This study demonstrated that physical education classes can induce improvement both in strength and muscular power in these female students. However, the efficacy of the strength training programme was not totally proven, because the time of application perhaps was limited.We can say that regular PE classes and maturation can induce enhancement in physical performance.In addition, organized physical education lessons, based on strength training plans, develop and achieve betterevident gains. Therefore, both processes generate well-being and healthy habits in children and adolescents throughout life.

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Oral

CAN AEROBIC POWER (VO_{2MAX}) BE ASSESSED BY BACKWARD EXTRAPOLATION IN SWIMMING?

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INTRODUCTION

The maximum power at which the oxidative system can operate - aerobic power - is traditionally assessed by determining the maximal oxygen uptake (VO_{2max}). In swimming, although the gold standard technology for VO_2 assessment is reliable and reproducible (direct oximetry using bxb measurements, cf. Baldari et al. 2013), the ecology of competitive events seems to be impaired (Keskinen et al. 2003). To minimize this problem, an alternative methodology was proposed: the backward extrapolation of the oxygen consumption (VO_2) recovery curve (Lavoie et al. 1983). Our aim was to verify if the VO_{2max} values obtained during a time to exhaustion at the velocity that elicits VO_{2max} test (TLim-vVO_{2max}) could be assessed accurately using backward extrapolation.

METHODS

Nine trained swimmers performed an intermittent incremental protocol for the vVO_{2max} assessment (Fernandes et al. 2003). 24h later, they performed a TLim-vVO_{2max}, in which their VO_2 kinetics was evaluated. VO_2 was directly measured using a K4b2 connected to the Aquatrainer, a low hydrodynamic resistance respiratory snorkel and valve system (both from Cosmed, Italy). A visual pacer controlled velocity and swimmers used continuous rhythmical breathing during the effort and in the recovery period. Expired gas concentrations were measured bxb and averaged every 5s. Backward extrapolation consisted in a linear regression curve between time (20s immediately after the 10s of dead space to simulate a simple recovery assessment) and VO_2 to predict the VO_2 at time zero. Paired Samples Test, correlation and agreement between VO_{2max} values using direct oximetry and backward extrapolation during TLim-vVO_{2max} were applied.

RESULTS

VO_{2max} obtained with direct ventilatory data collection and using backward extrapolation were similar (57.11±8.38 vs 58.50±7.94 $ml \cdot kg^{-1} \cdot min^{-1}$, p =0.42) and positively correlated (r=0.82, P<0.01). Moreover, Bland-Altman plot showed that VO_{2max} can be accessed through backward extrapolation with a Bias of only -1.40 $ml \cdot kg^{-1} \cdot min^{-1}$ (-2.59%).

DISCUSSION

It was observed that a simple 20s breath sample seems to be reliable in assessing VO_{2max} values at aerobic power intensity. So, as VO_{2max} is a relevant endurance performance index, when aiming to a more ecologic and coach friendly approach, its assessment using backward extrapolation seems to be an excellent alternative.

FINANCIAL SUPPORT

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MAXIMAL AEROBIC SPEED AND VO_{2MAX} IN ROLLER SPEED SKATING

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INTRODUCTION

Roller Speed Skating combines the movement pattern of ice speed skatingand the pack-oriented competition modes fromcycling (2). Few studies have been made about roller speed skatingphysiology (1,2); many of them registeredthe VO_2 values, however,they did not investigate the relationship with the Maximal Aerobic Speed (MAS).The aim of the present study was to assess the VO_2 and MAS valuesand their association in Roller Speed Skaters.

METHODS

Twelve elite roller speed skaters (19.4±4.6 years) performed twoprogressive incremental tests (T1 and T2) in a 200m indoortrack (skating at 15km·h^{-1}, step duration of 1 minute, and increments of 1km·h^{-1} up toexhaustion). T1 was performed witha portable metabolicgas analyzer, Jaeger Oxycon Mobile.T2 was performed witha heart rate monitor, Polar RS800. Heart rate(HR) and lactate samples (LS)were collected in T1 and T2.

RESULTS

The results in test T1 were: 4167.9±456.5 mL·min^{-1} of absolute VO_{2max}; 60.2±7.6 mL·kg^{-1}·min^{-1} of relative VO_{2max};and 159.8±22.3 L·min^{-1}of maximal ventilation..The MAS was35.7±1.6 km·h^{-1} in T1 and 36.7±1.6 km·h^{-1} in T2.. The maximal HRwas 195.2±7.5 bpm in T1and196.3±9.2 bpm in T2..The maximal values of LS were12.9±2.9 mmol·L^{-1}in T1 and 13.9±1.6 mmol·L^{-1} in T2. .No correlation appeared between VO_{2max} and MAS in T1 ($r=0.271$; $p>0.394$). A large significant correlation between T1 and T2 was found in MAS ($r=0.965$; $p<0.001$) and in maximal HR ($r=0.800$; $p<0.002$).Despite, there were significant differences between T1 and T2 in MAS ($p<0.001$), no differences appeared in maximalHR ($p>0.508$) and in maximal LS($p>0.258$).

DISCUSSION

The VO_{2max} obtained similar values as other elite level ice speed skaters (1) andelite level roller speed skaters (1,2). The MAS was the highest found in studies with roller speed skaters (2). Roller Speed Skating does not dependon physiological parametersonly (3);the biomechanical pattern of the speed skaters determines the MAS too,since an absence of correlation between VO_{2max} and MAS was observed.MAS may be affected by the protocol, the conditions or the material employed in tests. Then, control of these variables should bemade in order to use MAS for training prescription or talent acquisition in roller speed skating.

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Oral

THE USE OF GRADUATED COMPRESSION STOCKINGS DURING THREE WEEKS DOES NOT INFLUENCE CARDIORRESPIRATORY PERFORMANCE

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INTRODUCTION

The number of runners using Graduated Compression Stocking (GCS) is increasing for their potential cardiorrespiratory improvements. However, recent studies have not found enough evidence to support this idea. The aim of this study was to examine the cardiorrespiratory responses during running after three weeks of Graduated Compression Stockings use.

METHODS

Twenty runners performed three running tests on different days: test 1) a 5-min maximal effort run on a 400-m track in order to determine the individual's maximal aerobic speed; tests 2) and 3) a fatigue running test of 30 min at 80% of their maximal aerobic speed with GCS or placebo stockings. Cardiorrespiratory measurements were registered by a gas analyzer and a heath rate belt. Before the tests, runners trained with the assigned stocking (GCS or PLACEBO) during three weeks. The difference between the end and the start of the fatigue run was analyzed between conditions (GCS vs PLACEBO).

RESULTS

No differences were found in any of the cardiorrespiratory variables analysed (minute ventilation, hearth rate, relative oxygen consumption, relative carbon dioxide production, ventilatory equivalents for oxygen and carbon dioxide, and oxygen pulse) between GCS and PLACEBO.

DISCUSSION

Running economy is an important factor to predict middle- and long- distance running performance, and clothing may be an additional factor to change running economy (Bringard et al.,2006). Bringard et al. (2006) observed improvements in running economy with GCS while other studies did not find any difference (Ali et al., 2010). In the present study, no differences in running economy (difference between the end and the start of the test in VO_2/KG) were found when using the GCS or the placebo garment. Discrepancies between results could relate to the training status of participants and not to the test intensity. Previous studies have suggested that the increase in venous return results in a reduction of heart rate. In the present study there were no differences in HR when using GCS or the placebo garments, which is also in accordance with previous findings (Ali et al.,2010; Bringard et al.,2006). Taking into account the results of previous studies and the present work, we demonstrated that running with GCS during three weeks did not influence cardiorrespiratory parameters in runners.

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CARDIOVASCULAR RESPONSE ACCORDING TO DRILL SPECIFICITY IN PROFESSIONAL BASKETBALL PLAYERS

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INTRODUCTION

The aim of this study was to determine how different basketball drills affects the internal workload (heart rate; HR) depending on specificity of the confrontation format, related to the number of players (equality: 2v2, 3v3, 4v4, 5v5; and superiority: 2vX and 3cX) and the pitch size (full court, 1c; more than 1c consecutively, Xc) (Schelling and Torres-Ronda, 2013) in professional basketball players.

PROMEDIO METHODS

Thirteen professional basketball players from Spanish 1st Division (age: 25.5±4.7 y; height: 198.8±8.8 cm; weight: 93.3±12.8 kg) participated in the study. HR was recorded during every training session along the whole season. A 3-week period of training was randomly selected, which included a total of 137 exercises. Differences in cardiovascular response (Hear rate mean, HR_{mean} -bpm-; relative to players' maximal HR, $\%HR_{max}$ -%-) amongst the basketballs drills were compared using the Cohen's *d* (*d*) as Effect Size indicator, with 95% Confidence Interval.

RESULTS

The main results showed greater HR responses for the 'superiority' exercises (2vX and 3vX; 1c and Xc; ~4.5-min) and 'scrimmage' (5v5; Xc; ~7.1-min), [HR_{mean}: 156.8±11.5 and 149.2±20.0, respectively; $\%HR_{max}$: 75.8±5.6 and 72.1±9.6, respectively] than in small-sided games in numerical equality (2v2 and 3v3; 1c and Xc; ~4.6-min; and 4v4; 1c; ~7-min) [HR_{mean}: 141.4±17.5 and 133±21.1; $\%HR_{max}$: 68±8.0 and 64.4±5.6, for 2v2+3v3 and 4v4, respectively]. The differences in HR responses (HR_{mean} and $\%HR_{max}$) between drills were from small to large: 2v2+3v3 vs Superiority (*d*: -1.04, -1.14, respectively), 2v2+3v3 vs 4v4 (*d*: 0.43, 0.54, respectively), 2v2+3v3 vs 5v5 (*d*: -0.42, -0.46, respectively), Superiority vs 4v4 (*d*: 1.40, 2.07, respectively), 4v4 vs 5v5 (*d*: 0.78, 0.99, respectively).

CONCLUSIONS

The results suggested that 'scrimmage' is the most demanding exercise. Findings also revealed that playing in 'superiority' elicited higher cardiovascular demands than in numerical equality. Despite less specificity than a real game or scrimmage, 2v2 and 3v3 (Xc) exercises should be preferred to 4c4 (1c) for a better conditioning development. This study provided practial information on how to use different basketball drills depending on physiological and conditioning aims.

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Oral

ACUTE EFFECTS OF STATIC STRETCHING AND WHOLE-BODY VIBRATION AS WARM-UPON KAYAKING START PHASE TIME

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INTRODUCTION

The start phase in sprint kayak racing is a great percentage of the race success. Thus, a proper warm-up is required to get ready for the competition, but there is a lack of agreement about the effect of including stretching or vibration during the warm-up. The purpose of this study was to examine the acute effects of static stretching (SS), whole body vibration (WBV), SS plus WBV (SS+WBV) and only general warm-up (C) prior to a 12-m kayak sprint.

METHODS

Ten elite kayakers (8 men and 2 women) with international competitive level in flat water events volunteered for the study. After a general warm up, the subjects performed a specific warm-up protocol during 4min 30s: SS (20s each stretching), WBV(50Hz, 2.51mm peak-to-peak), SS+WBV or C. Specific warm-up protocols were randomly applied one per week during 4 weeks. Then, a 12-m maximum kayak sprint from a stationary start was performed. All paddlers began after the signal with the left blade submerged. Tests were performed in a dew pond, using a linear position transducer recording the split time at 2, 5 and 10m.

RESULTS

Time to achieve 2m after SS protocol was significantly lower compared with WBV (-7.4%; p = 0.041; d = 0.46) and SS-WBV (-8.9%; p = 0.05; d = 0.54). Likewise, time to achieve 5m was lower after SS in respect to WBV (-5.1%; p = 0.04; d = 0.39) and SS-WBV (-5.8%; p = 0.05; d = 0.44). However, no differences were observed in time to achieve 10m after the application of any protocol.

DISCUSSION

As it has been observed in previous studies (1), the inclusion of short duration stretching exercises within the warm-up (<30s per muscle) may not affect negatively in subsequent performance, especially if the population is highly trained. Although a positive effect induced by WBV on upper limb performance has been demonstrated when the stimulus is applied during the exercise, when WBV is applied 60s prior to the performance there is no benefit (2). According to Yapicioglu et al. (3) it seems that SS or SS+WBV have not any negative or positive effect before performing explosive actions. In conclusion, the inclusion of WBV in the warm up of elite kayakers does not provide any benefit in comparison with the inclusion of static stretching

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MEAN VELOCITY IN ACCELERATION PHASE OF TRUNK ROTATIONS TO THE DOMINANT AND NON-DOMINANT SIDE IN GOLFERS AND TENNIS PLAYERS

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INTRODUCTION

Trunk muscles (erector spinae, abdominal oblique, and rectus abdominis) are particularly active during the acceleration phase of trunk rotations (e.g., the golf swing) with the trial-side abdominal oblique muscles showing the highest level of activity (1). However, to which extent the asymmetric loading of trunk muscles in sports such as golf, tennis, or hockey causes side-to-side differences in trunk rotation velocity has not been specified. Therefore, mean velocity in acceleration phase of trunk rotations to the dominant and non-dominant side in golfers, tennis players and control subjects was compared.

METHODS

Group of 16 golfers (age 24.1 ± 3.7 years, height 178.5 ± 6.7 cm, weight 86.8 ± 10.2 kg), 14 tennis players (age 21.5 ± 1.2 years, height 181.4 ± 5.3 cm, weight 82.8 ± 7.8 kg), and 30 control fit individuals (age 21.7 ± 0.8 years, height 179.5 ± 4.7 cm, weight 80.8 ± 8.8 kg) performed 5 rotations of the trunk to each side in a seated position with barbell of 1 kg and 20 kg placed on the shoulders. The FiTRO Torso Dynamometer was used to monitor basic biomechanical parameters involved in exercise. The system measures angular velocity and calculates circumferential velocity, as follows: $v_{\omega} = (\omega/360) \times 2\pi r$, where ω is the angular velocity, and r is the turning radius.

RESULTS

Golfers showed significantly higher mean velocity in the dominant than non-dominant side with 1 kg (393.1 ± 79.5 vs. 360.7 ± 63.9 °/s, p = 0.047) but not with 20 kg (156.5 ± 29.6 vs. 154.7 ± 25.5 °/s, p = 0.547). However, tennis players demonstrated significantly higher mean velocity in the dominant than non-dominant side with both 1 kg (442.8 ± 87.9 vs. 394.7 ± 80.3 °/s, p = 0.017) and 20 kg (197.8 ± 39.7 vs. 164.6 ± 31.2 °/s, p = 0.048). On the other hand, no significant side-to-side differences in mean velocity in acceleration phase of trunk rotation with weight of 1 kg (377.1 ± 75.4 vs. 354.7 ± 71.1 °/s, p = 0.378) and 20 kg (150.7 ± 28.4 vs. 150.4 ± 29.3 °/s, p = 0.655) in fit counterparts were found.

DISCUSSION

Taking into account no significant side-to-side differences in mean velocity in acceleration phase of trunk rotation in control fit individuals and its higher values in the dominant than non-dominant side in golfers with 1 kg and tennis players with 1 and 20 kg, this parameter may be considered specific to asymmetric loading of trunk rotation.

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Oral

EVOLUTION OF THE LATERAL SYMMETRY OF THE LOWERS LIMBS OF PROFESSIONAL FOOTBALLERS DURING THE SEASON

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INTRODUCTION

Tensiomyography (TMG) as a non-invasive method of neuromuscular assessment, can be relevant to establishthe monitoring of the athlete throughout the season, showing how his muscles react and accept particular training and competition loads, as well as be used as reference values of a certain competitive level (1,3). In addition, it has been used to determine the lateral and functional symmetry of the athletes (2).

METHODS

Forty footballers belonging to two professional soccer teams of the Spanish League were tested in three different periods of the season. The contractile properties of vastus-medialis (VM), vastuslateralis (VL), rectus femoris (RF), and biceps femoris (BF) of both legs were determined by TMG. The parameters were registered following the assessment protocol indicated by García-García et al. (1). The lateral symmetry percentages (LS) were calculated following the algorithm, which implements the software TMG-BMC tensiomyography®, where time contraction and maximum radial displacement of muscle are most important parameters. One-way ANOVA with bonferroni test ($p \leq 0.05$) was implemented having into account the period of the season as an independent factor. The Intra-class correlation coefficient (ICC) was also calculated.

RESULTS

The sample analyzed is normal. It has been found an ICC above 0.8 in all the muscles tested. No significant differences have been found between both legs. LS of VM(92.5±2.7% vs 85.1±8.9% vs 89±6.4%; p=0.009) and RF (84.3±9% vs 90.2±6.3% vs 86.7±6.9%; p=0.05) showvariations along the three periods of the season.

DISCUSSION

These findings are in linewith the lack of significant differences between both legs of professional volleyball players (4) and of professional cyclists (1), tested with TMG. It has been suggested that the lack of significant differences betweenboth sides, when the percentage of LS determined by software TMG is above to 80%, it could be considered as appropriate (2).

The LS percentages of VM and RF vary throughout the season; however, it has not been found any pattern in this variation.

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EFFECT OF AN ACTIVATION PROTOCOL BASED ON POSTACTIVATION POTENTIATION ON SWIMMING START PERFORMANCE

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INTRODUCTION

There is a potentiation method called Postactivation Potentiation (PAP) which is based on the application of near maximal loads, conducted prior to the exercise performance, which improves the ballistic movement (Tillin & Bishop, 2009). The purpose of this study was to compare the effect of an activation protocol on swimming start performance (SS).

METHODS

Fourteen trained volunteer swimmers participated in the study. An intra-group design of randomized repetitive measurements was applied. A previous standard SS trial after a standard warm up served as reference (P1). One method of activation was applied: Four repetitions in the flywheel YoYo Squat (P2). Kinematic variable of SS were collected using video analysis

RESULTS

After P2, the subjects achieved a higher mean horizontal velocity during the flight (VxH) (4.89 ± 0.12 m/s) than after P1 (3.63 ± 0.11 m/s) ($p < 0.001$). After P2, it took the subjects less time to cover a distance of five meters (T5m) (1.65 ± 0.052 sec) compared to P1 (1.75 ± 0.057 sec) ($p \leq 0.001$).

DISCUSSION

The use of the flywheel device was based on two clear objectives: taking advantage of the high lower limb activation which provokes potentiation; and the possibility to execute an activation gesture almost identical to the real action. The results obtained in this study are clear evidence that an improvement of the peak forces occurred on the block as was observed by Breed and Young (2003). We observed that VxH ostensibly improved, which means that the swimmer's flight was longer and faster. T5m also showed to be shorter after P2 application, suggesting that take-off potentiation provokes that swimmer enter into the water with more velocity. These results suggest that a warm up based on the PAP by repetitions on the flywheel improves the SS.

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Oral

LOW SPEED ENDURANCE TRAINING VOLUME PRODUCES MORE ANAEROBIC CAPACITY GAINS THAN HIGH VOLUME

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INTRODUCTION

Speed endurance production training, is a powerful stimulus for team sports players by increasing their anaerobic capacity. Generally 3-12 bouts about 40 s at 70-100% of the maximum speed, with a 1:5 exercise: rest ratio (1). But there is no research on the differences that may exist in applying different workloads. The aim of the present study was to compare the performance effects produced by 4 weeks of different volumes of speed endurance training (SET) in soccer players during the season, and to investigate the changes through this different training in jumping ability, and metabolic response.

METHODS

Twelve semi-professional soccer were randomly assigned to either high volume training (HVT) (8-10 rep) or low volume training (LVT) (4-5 rep), and performed one session a week an addition training consisted of all out 30-s runs, which includes parts with ball and changes of directions, with 3 minutes of rest, during 4 weeks. Before and after the training intervention, players completed a Yo-Yo Intermittent Recovery Test Level 2 (Yo-Yo IR2), sprint test and countermovement jump (CMJ)

RESULTS

A related samples t-test was used to analyse Yo-Yo IRT-2 performance pre-post SET training as well as to analyse acute effects of pre- and post- specific SET training session with CMJ and lactate changes. Yo-Yo IRT-2 performance improved significantly for two groups ($p<0.001$) showing a surprisingly higher improvement in the LVG (pre 540 ± 115m – post 683 ± 153m; 26.5%; $p<0.01$; effect size (ES) 1.04) compared to the HVG (pre 544 ± 163m – post 616 ± 184m; 13.2%; $p<0.05$; ES 0.41) in Yo-Yo IRT-2. No significantly performance differences were found in sprint test and CMJ. Acute mechanical effects measured as CMJ height loss pre-post specific SET training session as average was significant (7.2%), and fatigue, measured as CMJ height loss, was significant for two groups, respectively ($p<0.01$; $p<0.05$) showing a higher decrement in the HVG (8.5%; $p<0.01$; ES 0.93) compared to the LVG (5.5%; $p<0.05$; ES 0.62) and was correlated to lactate ($r = 0.9$) in each subject, checking that values were moderate in LVG (5.95 $mmol \cdot L^{-1}$) and large in HVG (8.74 $mmol \cdot L^{-1}$).

CONCLUSIONS

These findings suggest that low-volume SET training, although required a reduced workload, produced better performance effects than high-volume in 4 weeks. In addition it entails a significant reduction in the amount of training and players undergo less fatigue, allowing an early recovery. In summary, the present study showed that in trained soccer players an addition of one weekly SET session during 4 weeks, elevated anaerobic capacities, and also suggest that it is not necessary to carry large volumes to find performance improvements. References: 1. Iaia F.M & Bangsbo J. Speed endurance training is a powerful stimulus for physiological adaptations and performance improvements of athletes. *Scand J Med Sci Sport*, 2010 20(S.2) 11-23

Oral

EFFECTS OF POSTACTIVATION POTENTIATION ON POWER OUTPUT AFTER HIGH AND LOW INTENSITY OF SQUAT EXERCISE

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INTRODUCTION

It is widely accepted that contractions of maximal or near maximal intensity optimize postactivation potentiation (PAP) (1). It is still insufficient evidence to apply for PAP for sports activity because muscle fatigue and enhancing effect are present at the same time during heavy load exercise (2). It is unclear whether the effect of PAP is appeared by light load and how long the effects are remained. The purpose of the present study was to examine the effects of PAP on muscular strength and power after the different intensity of squat exercise and how long that effects are remained.

METHODS

Eight healthy athletes (21±2 years old), with a minimum of 2-years experience in resistance training, were volunteered in this study. After one repetition maximam (1RM) test, the subjects carried out heavy squat (80% of 1RM) until no longer keep up with the rhythm (2s down and 2s up). The number of times of execution of the 40% of 1RM squat exercise was set to double that for the same amount of work was carried out at 1RM of 80%. Loaded (30% of 1RM) counter movement jump (LCMJ) was performed before and after 1, 3, 5, 10, 20 min.

RESULTS

The magnitude increase in height of LCMJ was no difference between 40% of 1RM and 80% of 1RM squat exercise. However, an increase in power output after 80% of 1RM preload was remained longer than that of 40% of 1RM.

DISCUSSION

Young et al (3) have reported a significant increase in jump height of the counter movement jump (2.8%) multiplied by the load of 19kg after high conditioning contraction (a squat 5RM). However, the power output during LCMJ increased significantly after not only heavy (80% of 1RM) but also light (40% of 1RM) conditioning contraction in this study. However, it is likely that the same amount of work by 40% of 1RM increase power output. This may be because longer muscle activity would produce more recruitment MU activity even though at 40% of 1RM.

FINANCIAL SUPPORT

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Oral

ACTN3 R577X POLYMORPHISM IN MARATHON ATHLETES

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INTRODUCTION

The effect of the *ACTN3* genotype has mainly been studied in elite athletes, based on the hypothesis that its influence on muscle function would be most readily observable at the extremes of human performance. The X allele tends to be overrepresented in those humans with an 'extreme endurance phenotype', i.e. elite endurance athletes (1-2). The aim of this study was to examine the genotype distribution of the R577X polymorphism (rs1815739) in α-actinin-3 (*ACTN3*) gene among marathon athletes.

METHODS

Participants of the study were 173 men athletes with best personal time <3h in marathon (mean age=43.06 years). The control group consisted of 216 non-athletes male young adults (mean age=20.73 years). Genotyping was performed by polymerase chain reaction. We used the chi-square test to determine whether the genotypic frequencies of the *ACTN3* R577X genotypes differed between groups and logistic regression to calculate the odds ratio for being an marathoner based on the aforementioned genotypes. The SPSS 18.0 program was used for all statistical analyses.

RESULTS

Genotype allele frequencies were similar between marathon atlethes and control groups ($P>0.05$). We did not find an association between the *ACTN3* R577X polymorphism and the likelihood of being an atlethe marathon using the dominant (RR vs. RX+XX) and the recessive model (RR+RX vs. XX).

DISCUSSION

The *ACTN3* R577X polymorphism is not associated with marathon athlete status, at least in the cohort we studied. These results were theoretically unexpected, given the role of α-actinin-3 on skeletal muscle phenotypes, particularly muscle endurance and the importance of this phenotype for marathon performance.

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Oral

CARDIOMETABOLIC RESPONSES TO A BATTLING ROPE HIGH INTENSITY INTERVAL TRAINING PROTOCOL

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INTRODUCTION

Battle rope training, consisting on vigorously undulating a rope with the upper body, has become a popular cardiovascular training choice, due the growing popularity of Extreme Conditioning Programs (ECPs; e.g. Crossfit, Insanity, Elements™, and others) (1). Despite widespread use, little is known about the cardiometabolic demands of battle rope training (2, 3).

METHODS

Eight healthy and physically active male (age=30.4±4.2 years, height=1.76±0.05 m, body mass=77.1±9.3 kg, fat mass=15.53±6.35 %), with no history of upper body or trunk injury in the last six months, completed a treadmill test for maximal oxygen uptake. On the second testing session, subjects completed a battle rope interval training protocol, similar to those used by Tanisho et al. (4): 10 sets of 10-secondmaximal effort of double arm waves, with 20-secondrecovery periods. They used a 15m rope anchored to a post, resulting in the participant holding 7,5m of rope in each hand. A Wilcoxon Test was used to compare the different measurements assessed in both, treadmill test and battle rope interval training protocol. Values of $p<0.05$ were considered statistically different.

RESULTS

The average heart rate for the workout (175±10 bpm) was significantly lower than the maximum heart rate (189±9 bpm), representing the 93.5±2.1% of it (Z=-2.10; p=0.036). In addition, the average peak VO_2 for the workout (46.2±4.1ml·kg^{-1}·min^{-1}),was significantly different from the maximum VO_2 (53.0±4.6ml·kg^{-1}·min^{-1}), representing the 87.2±10.5% of it (Z=-2.521; p=0.012).

DISCUSSION

The results of this study suggest that an acute 5-minute interval protocol of battle rope training is a vigorous-intensity workout, resulting in very high heart rates. Our results are similar to those reported by Fountaine& Schmidt (2), and to other alternative modes of cardiovascular training used in ECPs, like kettlebell training. In a population similar to our study (5), a high intensity kettlebell workout, consisting of 35 second standard swing intervals followed by 25 seconds rest intervals, resulted in average heart rates of 180±12 bpm, average VO_2 of 34 ml·kg^{-1}·min^{-1}, and 52.3±10.5kJ/min.

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Oral

RELATIONSHIP BETWEEN TRUNK STABILITY AND TRUNK MUSCULAR FITNESS

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INTRODUCTION

Although trunk muscular strength and endurance could be determinant of trunk/core stability (van Dieen et al., 2012), there is a lack of studies on the relationship between trunk muscular fitness and stability. The aim of this study was to analyze and describe this relationship in order to better understand which variables are more influential in trunk stability.

METHODS

36 male recreational athletes participated in this study. Two different methodologies were used to assess trunk stability. A battery of static and dynamic tests was performed to measure trunk balancing while sitting on stable and unstable seats placed on a force plate (Kistler 9286A). Postural and dynamic sway were assessed by analyzing the mean radial displacement of the centre of pressure. Sudden and unexpected trunk loads in anterior, posterior and lateral directions were applied to the thorax by a pneumatic actuator, while the subject was seated with the pelvis fixed. Trunk angular displacement was measured and the damping and stiffness coefficients of the trunk were calculated from the first 110 ms of data. An isokinetic test, consisting of 4 trials of 15 maximal flexion-extension exertions at 120º/s (ROM = 50º), was used to assess trunk muscle fitness. Absolute and relative peak torque and maximum work were calculated to assess trunk strength; and endurance ratio, maximum work ratio and final fatigue ratio were used to assess trunk endurance.

RESULTS

No correlations were found between trunk flexion and extension muscle fitness and trunk response to sudden perturbations, or between trunk flexion muscle fitness and trunk balance control while sitting. On the contrary, for the extensor muscles, higher absolute and relative peak torque and maximum work ($-0.330 < r < -0.424$), and higher maximum work ratio were significantly related with lower error during sitting balance tasks.

CONCLUSION

Our results suggest that the ability to generate higher extension forces in a short time (explosive strength) might facilitate the performance of quick postural adjustments during trunk balancing tasks (Izquierdo et al., 1999; Young & Metzl, 2010). In addition, trunk extensor endurance correlated with trunk balancing while sitting may be due to the length (70 s) and number of trials (18) executed during the battery of trunk balance tests.

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THE PROGRESSIVE INCREASE IN BODY WEIGHT AFFECTS LEG STIFFNESS DURING HOPPING AT DIFFERENT FREQUENCIES

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INTRODUCTION

During human locomotion, the overall stiffness of the lower limbs (leg stiffness, K_{leg}) is directly related to the efficiency of the stretch-shortening cycle. K_{leg} represent the average stiffness of the musculoskeletal system during the ground contact phase (Farley & Morgenroth, 1999). In this sense, according to Kuitunen et al. (2011), a high stiffness of the leg optimizes power output and reduces metabolic costs, increasing athletic performance. However, further research is needed to know how training with weighted vest could affect K_{leg}. Furthermore, the aim of this study is to test the effect of different load conditions on leg stiffness during hopping performed at different frequencies.

METHODS

The experiment consisted in a single session, in which both the hopping frequency and load percentage (independent variables) were randomly tested in order to know the effect on the K_{leg} (dependent variable) during a hopping task. Thirteen healthy male subjects (23.33 ±1.50 yrs; 68.09 ±5.92 Kg; 173 ±0.04 cm) were required to perform two legged hopping. The hopping frequency (1.8, 2.2, 2.6 & 3.0 Hz) were established through a digital metronome. The different overload conditions were determined in relation to the body weight (0%, 5%, 10%, 15% & 20%) and were carried out through weighted vest. To test the effect on leg stiffness, a two way repeated measures ANOVA (load x frequency) was performed. The alpha level was set at $p \leq 0.05$.

RESULTS

The ANOVA-RM showed a significant effect for frequency and load ($p \leq 0.001$ and $p \leq 0.05$, respectively), and a significant interaction between both factors ($p \leq 0.05$). The results demonstrated a significant increase of K_{leg} when hopping frequency is increased ($p \leq 0.05$). However, the analysis revealed a significant effect of the different load conditions during hopping at 3.0 Hz. Under this condition (3.0 Hz), K_{leg} significantly increased when subjects wore weighted vest with 10, 15 and 20% of BW.

DISCUSSION

Present study showed a significant increase of leg stiffness as the hopping frequency increase, associated with a decrease in contact time (Farley et al., 1991). This relationship between hopping frequency and leg stiffness remains for different overload conditions. Furthermore, the results showed a significant increase in leg stiffness due to overload, only when the hopping frequency is greater than or equal to 3Hz and loads higher than 10% of BW. Present result could be taken into account by those coaches and trainers when planning their training programs, if they seek specific effects on K_{leg}.

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Oral

THE RELATIONSHIP BETWEEN NEUROMUSCULAR FORCE-VELOCITY CHARACTERISTICS AND PERFORMANCE INDICATORS IN COMPETITIVE DISTANCE RUNNERS

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INTRODUCTION

Economy and peak velocity at VO_2 max (v VO_2 max) arenow thought to be the main performance indicators in elite distance runners (1). Economy is the amount of metabolic energy expended at a given velocity. v VO_2 max(v VO_2 max)is therunning velocity attained at the endof a maximum oxygen uptake test. In addition to cardiovascular output, economy and v $VO_{2\ max}$ are thought to be partly determined by the capacity of the neuromuscular system (2). The ground contact phase in running is the only phase in which the neuromuscular system produces force against the ground to horizontally propel the body. Neuromuscular ability can be assessed by measuring the force capabilities of the leg musculature at various velocities. Maximal-strength tests assess the ability of the leg extensors to produce maximal forceduring high-load, low or zero-velocity, movements (i.e. isometric mid-thigh pull). Reactive-strength tests assess the ability of the leg extensors to rapidly absorb and produce force during low-load, high-velocity movements (i.e. drop jumps), similar to those experienced in running. The purpose of this study was to examine the relationship between neuromuscular force capabilities (maximal and reactive-strength tests) and performance indicators (running economy and v VO_2 max) in competitive distance runners, thus providing the strength and conditioning practitioner with further evidence concerning the use of strength training for endurance athletes.

METHODS

Twentysix competitive club runners (age 30.0 ± 8.5 years; height 178.3 ± 7.8 cm;mass69.3 ± 8.0 kg and $VO_{2\ max}$ 58.9 ± 4.3 mL/kg/min) were recruited from local running clubs. Each runner was assessed for economy, $_{v}VO_2$ max maximal-strength (isometric mid-thigh pull) and reactive-strength (30cm drop-jump).

RESULTS

The results showed that there was no relationship(r = .03)between isometric maximal-strength (36.5 ± 7.7 N/kg) and running economy (194 ± 13.4 mL/kg/km), but a significant moderate relationship (r = .349, p = .04)between maximal strength and v VO_2 max (20.3 ± 1.9 km/h) was exhibited. A weak relationship was found between reactive-strength index (1.1 ± 0.3) and running economy (r = .218) and v VO_2 max(r = .289),

DISCUSSION

The results from this study suggest that there may be a small-moderate relationship between neuromuscular ability and specific performance indicators in competitive distance runners. However further research is needed to ascertainwhether increasing maximal- and reactive-strength capabilities results inimproved running performance.

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EFFECTS OF 9 WEEKS STRENGTH + HIIT TRAINING ON ELDERLY COPD PATIENT'S FITNESS

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is associated with a progressive decrease in strength and endurance, especially in the elderly (1, 2). Combined strength and endurance training has been demonstrated to improve exercise tolerance, muscle strength, quality of life, dyspnea and fatigue in COPD patients (3). High intensity interval training (HIIT) has been shown to be as effective as continuous endurance exercise in terms of cardiovascular and muscular adaptations (4). Therefore, the main purpose of this study was to investigate the effects of 9 weeks strength and HIIT training on muscular strength, physical fitness and body composition in elderly patients with COPD.

METHODS

12 male COPD patients (83.7 ± 2.9 yrs; BMI=28.4 ± 2.5) from the geriatric hospital Virgen Del Valle were recruited. A cross over design was used. Subjects followed a 9 week strength + HIIT exercise program (2 sessions/wk, 45'/session). Maximal voluntary contraction (MVC) was measured by a dynamometer. Physical fitness was assessed by the standardized Senior Fitness Test (SFT) and body composition was assessed by a tanita bioimpedance system. Subjects' COPD level was calculated according to their Body mass index, airflow obstruction, dyspnea and exercise capacity (BODE index).The intervention will finish by the end of May 2014.

RESULTS

Subjects were classified as COPD level 1.6 ± 0.7 (low to moderate). Total body fat mass (FM) was 31.2 ± 4.8%, whereas fat free mass (FFM) was 49.3 ± 3.7kg. Mean MVC was 10.1 ± 3.6kg for arm abduction, 15.6 ± 5.1kg for hip flexion and 12.2 ± 2.3kg for leg extension. According to the SFT, upper extremities strength had a score according to percentile 10 of an age-matched Spanish population (P10), (5) (9.5± 5.2 reps), flexibility for upper and lower extremities were 19.8± 7.7 and 14.4± 9.0 cm, corresponding to a reference P40 and P30, respectively; lower extremity strength had a score of P30 (11.5±3.6 times) and agility levels corresponded to P40 (8.1±1.5 s).

DISCUSSION

Overall, our SFT results were lower than other age-matched studies (5). We expect to improve body composition and physical fitness according to Franssen et al (1). 50-100% improvements of the 1 RM test for all weight lifting exercises are also expected. Accordingly, MVC will be increased by 30-50%. Finally, we expect to significantly improve all components of the SFT. In conclusion, due that COPD patients show severely compromised exercise capacity and are limited by ventilatory constraints, strength + HIIT training could be an effective way to prescribe exercise in this specific population.

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Oral

FUNCTIONAL FITNESS AND HEALTH STATUS IN THE SPANISH ELDERLY

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INTRODUCTION

Functional fitness (FF) is defined as having the capacity to perform normal everyday activities safely and independently without undue fatigue (1). Furthermore, it is considered a sign of frailty syndrome, which is associated with increased risk for disease, falls, hospitalizations, disability and mortality (2). The aim of this study was to find the prevalence of risk for loss of functional mobility (FM) as an indicator of decreased FF and to identify its relationship with health status in the elderly.

METHODS

A cross-sectional study was carried out in a sample of 514 subjects aged greater than 64 years old living in Castilla-La Mancha (Spain). FF was evaluated by using Senior Fitness Test (1) and they were classified into three groups (risk for loss of FM, pre-risk for loss of FM and without risk for loss of FM) with the cutoffs generated elsewhere (3). The EQ-5D questionnaire was performed to measure health status (4).

RESULTS

The prevalence of risk for loss of FM was 5.2%, increased with age ($p < 0.05$) and was similar in both sexes. In addition, an increased risk for loss of FM was associated with a decline in health status (EQ-5D index: risk group = 0.57±0.29; pre-risk group = 0.81±0.22; without risk group = 0.88±0.14, $p < 0.05$). Also, a worst scores in all five dimensions of the EQ-5D (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) was reported with decreased FF (all $p < 0.01$). The group at risk for loss of FM showed poorer self-reported health status compared to the other groups (EQ-5D VAS: risk group = 6.66±1.77; pre-risk group = 7.63±1.98; without risk group = 8.00±1.78, $p < 0.05$).

DISCUSSION

The aging process was accompanied by decreased FF. This is similar to the findings from other study (1) that reported a decline in FF variables ranged from 32% to 44% between the ages of 60 and 90. Decreased FF was associated with a decline in health status. These findings confirm the influence that FF has on health status in the elderly (5). In conclusion, FF is shown essential to reduce the risk for disability and to improve health status in older adults.

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SEX DIFFERENCES IN RESISTANCE TRAINING INJURIES DURING A WEIGHT LOSS PROGRAM

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INTRODUCTION

The recent increase in participation of women in sport has led to a resultant increase in injuries in this population (1). In the last years, strength training has become more popular due to the latest findings showing that this type of training is beneficial to health including for weight loss programs (2-4). However, few studies have examined the sex differences in resistance training–related injuries.

METHODS

One hundred and twelve people (59 women and 53 men) with a body mass index between 25 and 34.9 kg/m^2, and aged from 18 to 50 years, participated in a 6-month resistance training intervention, while following a caloric restriction between 25-30% from total daily energy expenditure. Chi-square analysis was used for the initial comparison of the proportion of injury and sex. Logistic regression was used to further elucidate the sex differences and to estimate the odds ratio (OR) and its associated 95% confidence interval (CI).

RESULTS

Comparisons between the sexes for injury with resistance training showed that there was no related in OR for injuries between men and women (p>0.01, OR=1.41: 95% CI=0.65 to 3.01). During the 6-months program, 67 subjects reported any kind of injury (49.3% from women and 50.7% from men).

DISCUSSION

Women and men are injured at the same rate and there are no significant relationships between sex, resistance training and injury when volume, time and intensity of training are controlled and monitored (5). Different results were obtained by Quatman et al. (2009) which demonstrated that during strength training activities, women had a higher risk of accidental injuries and suffered more lower extremity injuries compared to men (p <0.001, OR = 1.69; 95% CI = 1.37 to 2.08). Men, however, suffered more exertional-type resistance training injuries such as sprains and strains compared to women (p <0.001, OR = 1.55; 95% CI = 1.25 to 1.96)., particularly at the trunk (1). Probably these results are due to a different sample size between men and women and future works should focus on the determination of whether the number of injuries is similar for both sexes when training sessions have the same intensity, volume, effort perception and the number of women and men is similar. (Clinical Trials gov number: NCT01116856).

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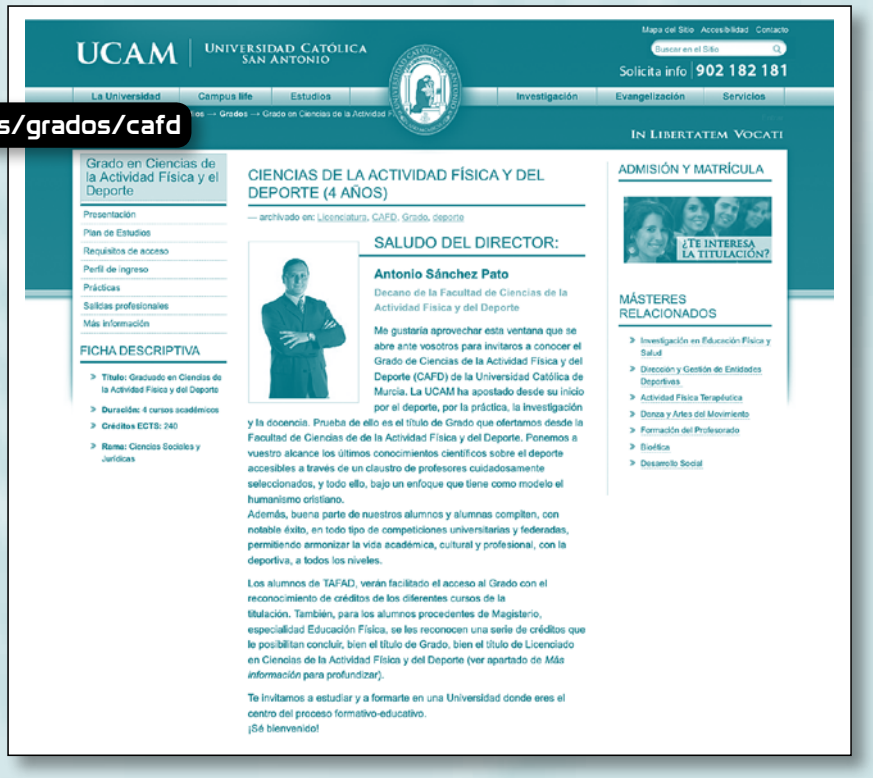

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Poster

Poster

ACUTE EFFECT OF ACTIVE HAMSTRING STRETCHING IN ADULTS WITH LIMITED HAMSTRING EXTENSIBILITY

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INTRODUCTION

Reduced hamstring extensibility has been proposed as a predisposing factor for low back disorders and changes in lumbopelvic rhythm (1). Different stretching techniques and protocols have found improvements in hamstring extensibility (2). Some studies have compared the effects of different stretching techniques on the length of the hamstring muscles and detected different effects according to the technique used. The purpose of this study was to determine the acute effect of an active hamstring stretching protocol in adults with limited hamstring flexibility.

METHODS

Thirty-six adults (28.78 ± 7.13 years) with a straight leg raise angle lower than 70º in both limbs were recruited for this study. The subjects performed a hamstring stretching protocol consisting of four active exercises. The session consisted of 3 sets of each exercise holding the position for 20 seconds with a 30-second rest between sets and exercises. Hamstring extensibility was determined by active knee extension and toe-touch tests. The distance from the toes (zero point) was measured in centimeters. All measures were performed before and immediately after the hamstring stretching protocol.

RESULTS

Mean (± SD) left active knee extension angles were 32.36 ± 9.32º in the pre-test and 23.28 ± 9.46º in the post-test ($p < 0.001$). For the right leg, the values were 31.06 ± 10.35º in the pre-test and 23.19 ± 11.20º in the post-test ($p < 0.001$). Significant improvements were also found in the toe-touch score (pre-test: -11.75 ± 7.66 cm; post-test: -4.89 ± 8.35 cm; $p < 0.001$).

DISCUSSION

Significant increases in the active knee extension test were detected after active stretching protocol. Several studies have found a significant improvement in active knee extension test in young adults (between 5-12º) immediately after other hamstring stretching protocols or single stretching (2,3). In the current study an improvement around 7-8º in the active knee extension test was found. Furthermore, an improvement in the toe-touch score was detected (mean difference pre-post score: +6.86 cm). This greater score after stretching could be related to an improved anterior pelvic tilt and greater lumbar flexion (1).

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Poster

IMMEDIATE EFFECTS OF HAMSTRING MUSCLE STRETCHING IN SAGITTAL SPINAL CURVATURES

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INTRODUCTION

Some studies have found that hamstring extensibility influences thoracic and pelvic postures when trunk flexion movements are performed (1). These studies are cross-sectional and no acute intervention was carried out. An acute change in hamstring extensibility may influence pelvic and spinal postures. Therefore, the purpose of this study was to determine the acute effect of hamstring stretching in spinal curvatures and pelvic tilt in relaxed standing and trunk flexion.

METHODS

Thirty-six male adults (28.78 ± 7.13 years) were recruited for this study. Sagittal thoracic and lumbar spinal curvatures and pelvic tilt were measured in relaxed standing and during the toe-touch test using a Spinal Mouse. Hamstring muscle extensibility was determined in both legs by active straight leg raise test. All measures were performed before and immediately after a stretching protocol consisting of four static exercises. The session consisted of 3 sets of each exercise holding the position for 20 seconds with a 30-second rest between sets and exercises.

RESULTS

Active straight leg raise angle significantly improved immediately after stretching protocol ($p < 0.001$). Greater anterior pelvic tilt ($p < 0.001$) and lumbar flexion ($p < 0.05$) and a smaller thoracic kyphosis in the toe-touch test ($p < 0.001$) were found after stretching protocol. However, no significant change on spinal curvatures or pelvic tilt was found in relaxed standing.

DISCUSSION

Significant increases in the active straight leg raise test immediately after stretching protocol were found. This change was associated to significant improvement in anterior pelvic tilt and lumbar flexion as well as reduced thoracic kyphosis in the toe-touch test. However, the spinal angles and pelvic tilt in standing was not influenced by hamstring extensibility, because the hamstring muscles are under little passive tension (2). These findings are important in sport activities that involve trunk flexion movements with knees extended or slightly bent because a reduction in thoracic kyphosis and improved anterior pelvic tilt after stretching can be achieved. This posture has been associated to lower disc loads and spinal forces (3). For these reasons, hamstring stretching is recommended prior to sport activities involving trunk flexion postures with knees straight.

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THE EFFECT OF WALKING WITH POLES ON GAIT-A KINEMATIC AND KINETIC PERSPECTIVE

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INTRODUCTION

Walking with poles (Nordic walking (NW)) is a popular leisure activity and recently its use in rehabilitation has increased considerably. NW was reported to increase metabolic and cardiovascular demands more than regular walking (RW) and may be able to reduce loads on lower limb joints. This study aimed to study the effect of NW versus RW on ground reaction forces (GRFs) at two walking speeds and to compare these effects in experienced and naïve Nordic walkers.

METHODS

Twenty-six naïve walkers aged 26±2.1 years and 14 experienced Nordic walkers aged 57.2 ±10.4 participated. Naïve participants practiced for 15 minutes to become familiar with the technical aspects of walking with poles and the experienced walkers warmed-up for the same period of time. Walking trials (along a 50m corridor) included self-selected speed and a fast speed (20% faster than the self selected cadence of RW controlled by a metronome), with and without poles. Walking trial order was random. GRFs of the forefoot and hindfoot were continuously recorded with a mobile SmartStep device (Andante Medical Devices, Inc, White Plains, New York). Gait parameters were recorded and analyzed using wireless sensors from the APDM's Mobility Lab™ (APDM Inc., Portland, OR, USA). Data was analyzed with repeated measures ANOVA.

RESULTS

No differences were found between the experienced and naïve nordic walkers. Stride Velocity at self selected speed was higher for NW compared with RW ($p<0.0001$).This was accompanied by increased GRFs in heal strike and toe off phases and by decreased GRFs in flat foot phase during NW ($p<0.01$). Waking at a faster speed increased the GRFs in heel strike and toe off phases while a reduction in GRFs was noticed in the flat foot phase in both NW ($p<0.0001$; $p<0.041$; $p<0.004$ respectively) and RW ($p<0.0001$). GRFs at faster walking speed had lower forces ($p=0.021$) at flat foot phase (Fast NW; 34.26±12.9, Fast RW; 36.85±11.39).

CONCLUSION

Self selected walking speed was faster for NW and was accompanied by an increase in GRFs in heel strike and tow-off phases and a decrease in GRFs in the foot flat phase. However, at the faster gait speed, decreased GRFs in the foot flat phase were found during NW as compared to RW. This suggests that shifting weight toward the poles in the flat foot phase reduces GRFs and may decrease loads on the plantar pressure distributions and help those with frail feet maintain activity.

Poster

COMPARISON OF HAMSTRING EXTENSIBILITY BETWEEN LEGS IN SYMMETRICAL AND ASYMMETRICAL SPORT DISCIPLINES

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INTRODUCTION

Several studies have analyzed the influence of systematic sport training in hamstring extensibility. When comparing extensibility values between both legs in symmetrical sports such as cycling and running most studies have found no significant differences (1, 2). However, asymmetrical movements during static or cyclic flexion postures could affect the hamstring extensibility. For this reason, the purpose of this study was to compare the hamstring extensibility between both legs in symmetrical and asymmetrical sport disciplines.

METHODS

A total of 116 male athletes (30 kayakers, 32 right-side canoeists, 29 left-side canoeists and 25 cyclists) were recruited for this study. Hamstring muscle extensibility was determined in both legs by passive straight leg raise test with the ankle of the tested leg in plantar flexion.

RESULTS

There were significant differences ($p<0.001$) between the right and the left leg in both right-side and left-side canoeists. The forward leg values were significantly higher than those for the kneeling leg (mean difference: 8.43º). No significant differences were found in kayakers and cyclists between legs (mean difference: 0.84º in kayakers and 0.54º in cyclists).

DISCUSSION

The principal finding was that forward leg extensibility values were significantly higher than kneeling leg in both right-side and left-side canoeists whereas no significant differences were found between legs in symmetrical sport disciplines (kayaking and cycling). This fact may be related to asymmetrical limb position and movement in the canoe. Canoeists train in a kneeling position and the knee of the forward leg is moderately flexed in the stroke phase while the trunk and pelvis are moderately flexed. This position only generates a slight stimulus of hamstring traction in forward leg. In contrast, kayakers and cyclists develop bilateral movement and performance symmetry. In this way, similarities, between the limbs, in the flexibility of these athletes could be related to similar movements and postures in the lower limbs (1, 2). In conclusion, the asymmetric posture and movement of canoeing generates differences in hamstring extensibility between legs.

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SAGITTAL SPINAL CURVATURES AND PELVIC TILT IN RELAXED STANDING OF FEMALE DANCERS

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INTRODUCTION

Dance is one of the most demanding physical activities undertaken by young people during childhood and adolescence. Adolescence is a critical period of growth and maturation. Spinal development is influenced by internal processes of growth, maturation and external stimuli such as normal activities of daily living and sports activities (1). Repetitive extension movements are common in dance. This discipline involves larger spinal movements and aligned torso postures. The specific and repetitive movements and postures in dance may affect the sagittal spinal curvatures (2). For this reason, the purpose of this study was to determine the evolution of spinal posture and pelvic tilt in relaxed standing in young female dancers.

METHODS

Forty-eight young female dancers (12.91 ± 2.06 year-old) were recruited for this study. All participants were in 4th of 5th year in the Dance Conservatory on the academic year 2012/2013. Thoracic kyphosis (TK), lumbar lordosis (LL) and pelvic tilt (PT) were measured in relaxed standing using a Spinal Mouse® in February 2013 and October 2013.

RESULTS

TK, LL and PT values in the first measurement were 20.56±11.34º, 27.27±6.71º and 21.61±4.45º, respectively. In the second measurement the values were 16.59±9.88º, 23.15±10.86º and 16.22±7.21º, respectively. Significant changes were found between both measures in TK (t=2.279; p=0.028), LL (t=-2.971; p=0.005) and PT (t=5.171; p<0.001).

DISCUSSION

Significant decreases in the TK, LL and PT were detected after an eight-month period of dance training in dancers with previous experience. These spinal curves have been related to specific exercises with frequent spinal extension and aligned trunk postures as commonly seen in dance (2,3). Previous cross-sectional studies (3, 4) have found that dancers showed a less TK and LL in the neutral standing position than sedentary age-matched females. Moller and Masharawi (2) compared spinal curvatures in fourteen female pupils (aged 6-9) after six months of ballet training (bi-weekly, 90 minutes of basic level). They found a significant decrease in the LL and a significant decrease in TK after the six months. In conclusion, our study found that dance training is associated to a decrease in the sagittal thoracic and lumbar curvatures and pelvic tilt.

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Poster

HAMSTRING EXTENSIBILITY OF PROFESSIONAL STUDIES FEMALE DANCERS

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INTRODUCTION

The specific postures and movements of the sport could influence hamstring muscle extensibility of athletes. A few studies have evaluated hamstring muscle extensibility in athletes, because it is an important factor in sports training (1). Dance requires significant control of trunk posture and flexibility, with specific exercises performed for the improvement of body image and posture with frequent hip flexion with knee extended. For this reason, the purpose of this study was to determine the degree of hamstring muscle extensibility in female dancers.

METHODS

One-hundred twenty-six female dancers (15.81±3.44 year-old) were recruited for this study. All participants were in Professional Studies (5th to 10th year) in the Dance Conservatory. Hamstring muscle extensibility was determined in both legs by passive straight leg raise test (PSLR). To classify the hamstring extensibility, the references proposed by Ferrer (2) were used (normal hamstring extensibility, PSLR ≥ 75º; reduced extensibility grade I, PSLR between 61º and 74º; reduced extensibility grade II, PSLR ≤ 60º).

RESULTS

Mean (± SD) PSLR angles were 115.87±16.20º and 115.94±16.68º, for right and left legs, respectively. No significant differences between legs were found (t=0.083; p=0.934). However, when mean differences were calculated between both legs for each dancer the differences between the values were 7.20±6.25º. One-hundred twenty-five dancers showed normal hamstring extensibility values in both legs (99.21%). Only one dancer had a reduced hamstring extensibility grade I in both legs (0.79%).

DISCUSSION

The principal finding was that right and left leg extensibility values were high. Previous studies have found that dancers have wide ranges of hamstring extensibility than sedentary subjects (3). Dance improves hamstring muscle extensibility because dancers performed specific hamstring stretching exercises and frequent hip flexion with knee extended. An important finding was that no significant differences were found between both legs when mean values are considered. However, when the mean differences between legs were individually analyzed, the results showed a moderate discrepancy between legs. More research on this topic is needed. In conclusion, dancers showed high hamstring extensibility values on both legs.

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EFFECT OF DIFFERENT WARM-UP INTENSITIES ON SWIMMING STARTS PERFORMANCES

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INTRODUCTION

The warm-up is used to optimize the swimming performance (1) and coaches/researchers need to be aware of its relevance. As a component part of a swimming event, the start has been reported to be critical for overall performance. Therefore, it is essential to understand the effects of warm-up on swimming start performance, being both determinants in competitive swimming.

METHODS

Eight male swimmers (17.63±1.3yrs) of national level participated in this study. On separate days, each swimmer performed a swim start to 15m under 50m freestyle, which was precededby two different warm-ups, in a randomized order. The warm-ups totaled 1200m and included some of the habitual procedures, differing in the main set. The warm-up focused in the velocity stimulation (VWU) comprised 4x50m (divided in 25m maximum and 25m easy swim). The warm-up focused on aerobic power (AWU) comprised8x50m at 80% ofmaximal velocity. The kinematical analysis of the start included the block, flight, entry, 5m and 15m phases. One camera (50Hz) videotaped the takeoff, the flight and the entry phases and other camera (50Hz) videotaped the 15m mark zone. Complementarily, the time to 5m and 15m were determined with a chronometer. To comparedata obtained in the two trials, Student paired t tests wereused.

RESULTS

There were no differences in swim starts between VWU and AWU, with regard to time to 5m (1.37±0.13s and 1.33±0.08s, p=0.10) and time to 15m (6.59±0.35s and 6.66±0.34s, p=0.32, respectively). Also, no differences were found during the block phase (0.59±0.05s and 0.58±0.04s, p=0.45) and the entry velocity in the water (9.29±1.73m/s and 9.62±1.59m/s, p=0.21, respectively). However, medium effect size values were verified in the entry velocity (ES=0.49), in the time to 5m (ES=0.67) and in the time to 15m (ES=0.41).

DISCUSSION

The two different stimuliused in this study produced similar dive start performances. The mechanisms behind the different warm-ups protocols could be different; however, both influenced the swimmers in the same way. Similar results in start times were found between a previous post activation potentiation and the usual warm-up (2). Considering the effect size values, in the present study the swimmers entered in the water with higher velocities after AWU, being faster at the 5m and inverting this difference in the 15m. We should be aware that the velocity stimulus could have not been enough to potentiate effectively the performance.

The results provide the basis for further investigation of the effectiveness of different warm-up strategies for enhancing starting actions.

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Poster

CONDITIONING PRIORITIES BASED ON CRICKET BATTING SHOT FREQUENCY FROM THE 2013 ICC CHAMPIONS TROPHY

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INTRODUCTION

Cricket is a game of reaction, batsmen must react by hitting the ball the bowler delivers. While batsmen have numerous ways of hitting the ball (batting shots); shot selection is largely dictated by both the width (line) and length (classified by the first bounce distance from the batsman) that the bowler delivers. In limited overs cricket, batting power is important to maximise scoring; yet while upper body strength has been positively correlated with maximal hitting distance, it has not been correlated with greater batting average or strike rate (1). It could be that upper body power is less important for the more frequently played shot types employed in limited overs cricket. Each particular shot type employs a specific set of muscles, therefore it is important to quantify the frequency that a batsman will play particular shots to prioritise strength and conditioning activities.

METHODS

We analysed the performance analysis data of delivered balls (7149) from 12 matches at the 2013 ICC Champions Trophy Tournament (competition for the world's top 8 nations) to determine the shot type frequency distribution of specific bowling delivery classifications. Each bowling delivery was assigned a pitch position from a matrix of 18 possible line and length combinations.

RESULTS

Our results demonstrate, batsman (combined left and right handed batting data) facing 100 deliveries; will most commonly face 49.9 ± 0.6 good length deliveries followed by 22.9 ± 0.8 full length deliveries and 19.5 ± 0.6 short deliveries. Batsmen will least frequently face bouncer (4.1 ± 0.5), full-toss (1.9 ± 0.3) and yorker (1.8 ±0.1) deliveries. Furthermore, we found the most prevalent shot hitting good length and full deliveries was the front foot drive (52%), whereas the cross bat hookshot(81%) was the most prevalent shot employed to hitbouncer length deliveries.

DISCUSSION

The main contribution of this paper is that strength and conditioning professionals should use cricket performance analysis data, combined with biomechanical research to prioritise batting strength programmes with a particular focus on the strengthening of musculature, grip force (2) and movement patterns (3) associated with the front foot drive shot.

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Poster

RELATIONSHIP BETWEEN AN ISOKINETIC TEST AND TWO FIELD TESTS TO ASSESS TRUNK MUSCLE FITNESS

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INTRODUCTION

Due to the important role of trunk muscles in athletic function and injury prevention, different protocols have been developed to evaluate trunk muscle strength and endurance in clinical, fitness and sports settings. The aim of this study was to analyze the relationship between an isokinetic test and two field tests to assess trunk muscle fitness.

METHODS

27 recreational male athletes participated in this study (age: 24.1 ±2.9 years; mass: 74.9±9.4 kg; height: 176.3±5.6 cm). To measure trunk flexor and extensor muscle strength and endurance, participants performed an isokinetic test in a dynamometer (BiodexÒ). This protocol consisted of 4 trials of 15 maximal flexion-extension exertions at 120º/s (ROM = 50º). Absolute and relative peak torque and maximum work were calculated to assess trunk muscular strength; and the final fatigue ratio and endurance ratio were calculated to assess trunk muscular endurance (Mayer et al., 1995). A month later, two field tests were performed to assess trunk muscle endurance, i.e., the *flexion-rotation trunk test* (FRT) to measure abdominal dynamic endurance (Brotons et al., 2013) and the *Biering-Sorensen test* (BST) to assess isometric back endurance (Biering-Sorensen, 1984). During the FRT, participants performed the maximum number of upper trunk flexions with rotation (i.e., *cross curl-ups*) possible in 90 s. In the BST participants held their upper body suspended against gravity in a horizontal-prone position until exhaustion, recording the test duration. Pearson and Sperman correlation coefficients were used to analyse the relationship between all variables. Each test was performed twice and the ICC was calculated to assess the reliability of the measures.

RESULTS

All variables showed a good reliability with ICCs> 0.70. No significant correlations were found between variables, although the FRT score showed a nearly significant correlation with relative peak torque (r=0.369; p=0.076) and relative maximum work (r=0.351; p=0.093) during the isokinetic flexion exertions.

DISCUSSION

The lack of relationship between the field test scores and the isokinetic test variables may be due to differences in the mechanical, metabolic and psychological demands of each test. Sport specific tests seem to be necessary to characterize the athletes' trunk muscle fitness properly.

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Poster

THE EFFECTS OF 16-WEEKS MAT PILATES PROGRAM ON HAMSTRING EXTENSIBILITY IN ACTIVE WOMEN

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INTRODUCTION

Pilates method offers a "core" workout in which fitness components like muscular strength and endurance, flexibility, balance and cardiorespiratory endurance are trained, with the goal of building a strong body under the philosophy of mind-over-body control (1). The exercises are typically performed for strengthening the abdominal muscles, hips, and back (2). Pilates also involves stretching exercises for improving hamstring extensibility because it is an important component of physical fitness and spinal health. For this reason, the purpose of this study was to determine the effects of Pilates exercise on hamstring extensibility in active women.

METHODS

Twenty-one women with a previous Pilates experience between 1 and 2 years (age: 42.95 ± 6.84 year-old; mat Pilates practice experience: 1.71 ± 0.80 years) participated in this study. Women participated in a mat Pilates program during 16 weeks (one hour, twice a week). Hamstring muscle extensibility was determined in both legs by passive straight leg raise test (PSLR) prior and after the program.

RESULTS

Mean (± SD) right PSLR angle was 98.62±13.10º and 104.05±14.08º in the pre- and the post-test, respectively. For the left leg, the value was 97.81±13.97º and 103.81±14.90º, respectively. Significant changes were found between both measures in the right leg (t=-2.365; p=0.028) and the left leg (t=-2.613; p=0.017). Not significant differences between right and left legs were found in the pre-test (t=0.344; p=0.734) and in the post-test (t=0.163; p=0.872).

DISCUSSION

Significant increases in the right and left PSLR angle were detected after 16-weeks of mat Pilates program in women with previous experience. Previous studies have found improved hamstring extensibility after a Pilates program (3). Greater hamstring extensibility has been related to better spinal and pelvic postures during lifting tasks and trunk bending postures. Greater hamstring extensibility is associated to greater anterior pelvic tilt and lower spinal flexion in trunk bending tasks. This posture has been associated to lower spinal forces (4). In conclusion, mat Pilates training is associated to a significant improvement on hamstring extensibility in adult women.

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Poster

EFFECT OF HIGH LOAD RESISTANCE EXERCISE ON NEUROMUSCULAR INTERLIMB FATIGUE RESPONSES ON BICEPS BRACHII

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INTRODUCTION

Neuromuscular fatigue induces impairments in the motor unit recruitment and decreases in the muscle fiber conduction velocity(1). Howard & Enoka (2) suggested that interlimb interactions during maximal bilateral contractions are mediated by neural mechanisms. Bagesteiro & Sainburg (4) propose that distinct neural control mechanisms are employed for dominant and nondominant arm movements. Tensiomiography (TMG) could be a useful tool for practitioners and researchers alike in detecting muscle damage and its recovery (3).

METHODS

Thirteen healthy moderately active subjects (age 25.1 ± 2.6 years; body mass 79.9 ± 8.9 kg; height ± 7.4 cm), accustomed to strength trainingand right handed, volunteered to participate in the study. They performed a curl-biceps exercise with a barbell: 5x8x30kg. with 1 min. of rest. TMG was used to measurethe mechanical properties of muscle response such as maximum radial displacement of muscle belly (Dm), contraction time (Tc) and delay time (Td), in the recovery period, at the end of each setand in the 3, 6, 10 and 15 min. of the recovery time.

RESULTS

The results show a difference behavior between right and left biceps brachii in different phases of the exercise for activation (Td) and Dm. Td indicates always a less values for right arm with significant statistical differences between all Sets ($P< 0.05$). Tc shows thesame behavior for both limbs, from Set 2 left arm has higher values than right arm but aren´t significant statistical difference. Dm for the right arm shows more stiffness than left arm (Set 2, $P< 0.05$). In the recovery period both arms have the same behavior for Tc and Td, while that Dm indicates differences between right and left arm (6 min. of recovery time, $P< 0.05$).

DISCUSSION

The differences between left and right arm were not statistically significant in Dm may be due to the individual adaptation to the neural fatigue (4). Td showed improved instantaneous capacity fiber recruitment in the dominant arm (right) which was significant statistical different (2). No differences were found for the contraction time (Tc), perhaps due to the different initial values between limbs.

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Poster

MANUAL RESISTANCE, CAN BE EFFECTIVE TOOL FOR PERSONAL TRAINERS?

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INTRODUCTION

The manual resistance (MARES) has been widely used in physical therapy for strengthening processes during rehabilitation phases, as for instance, to attempt to isolate scapular movement (1). MARES is a way to develop variable resistance and can be used in neuromuscular training for improve strength in healthy subjects (2). Recently has been shown that MARES can improve muscular strength and endurance in healthy college students(3). The aim of this study was compare the effects of 8-weeks on the level of muscular strength and endurance in 20 healthy young subjects.

METHODS

Twenty healthy trained volunteers were recruited for the 8-week study. Maximal strength and muscular endurance was measured. Subjects were randomized into 2 groups: a) MARES group (n= 10; 23.60±2.06 years); b) Conventional group (n=10;24.20±1.95 years). Conventional group performed lat pull-down and bench press, 3 sets of 8 repetitions with an intensity perceived effort of 8 and 1 minute of intra-set rest. MARES group performed the same training load insimilar movement than conventional group but were manual-resisted by an experienced personal trainer.

RESULTS

An analysis of variance (ANOVA) was performed to detect the difference between the results for different time points with Levene's post hoc test was conducted on data with significance set at p≤ 0.05. The resultsshowed no significant difference for maximal strength in both bench press (MARES pre 79.03 ±13.49; post 84.50 ±11.65) and lat pull down (MARES pre 73.50 ±7.83; post 80.50 ±7.97) or endurance(number of push-up repetitions MARES pre 21.90±6.04; MARES post 24.60±7.16) and number of pull-up repetitions (MARES pre 7.60±3.53; MARES post 9.60 ±2.87).

DISCUSSION

There is a trend toward increased levels of strength and endurance in both experimental groups, though not enough to be significant.Contrary to the data provided by Dorgo who obtained significant for levels of strength and endurance improvements (3).Maybe it's because in our study had a shorter duration, and subjects they had higher status in strength training.This study suggested that 8-weeks of MARES have similar effects than conventional training using the same volume and monitoring the rating of perceived effort than conventional training and could be used as resistance exercise by personal trainersto maintain muscle strength and endurance levels in healthy experimented subjects.

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RELATIONSHIP BETWEEN STRAIGHT SPRINTING AND CHANGE OF DIRECTION ABILITY IN MALE SOCCER PLAYERS

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INTRODUCTION

Soccer is considered an intermittent activity involving sudden variations in movement and intensity (1). The ability to accelerate and change direction becomes important in the development of physical qualities in soccer (2). The purposes of this study were to assess the straight sprinting and the change of direction ability (CODA). Furthermore, the relationship between these two abilities will be determined.

METHODS

Twenty male soccer players (age = 22.80 ± 2.71 yr, height = 1.88 ± 0.06 m, body mass = 76.47 ± 8.80 kg) competing in the Spanish Third Division Soccer League participated in the study. They performed regular specific soccer training 3 or 4 days per week. The subjects undertook three 15 m maximal straight sprints (3). A Modified agility T-Test (MAT) was used to measure the change of direction ability (4). A photocell (Microgate® Polifemo, Bolzano, Italy) was used to measure the time to complete the straight sprints and the MAT. The study was conducted according to the Declaration of Helsinki (2013).

RESULTS

The results of the 15 m straight sprint test and the MAT were 2.36 ± 0.07 s and 5.60 ± 0.20 s, respectively. The coefficient of variation for the former was 1.79% and for latter 2.62%. No significant correlation was found between straight sprinting and the CODA ($r = 0.022$, $p > 0.05$).

DISCUSSION

The relationships between straight sprinting and the CODA have been studied with controversial results (5). In this study, no significant correlations have been obtained between the 15 m maximal straight sprint test and the CODA in male soccer players. These data are consistent with the specificity and independence of the CODA and the straight sprint motor abilities previously observed by Salaj and Marcovic (6) with the use of principal component factor analysis.

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Poster

UNILATERAL VERTICAL JUMP PERFORMANCE IN SOCCER PLAYERS

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INTRODUCTION

Despite of the requirement of unilateral propulsion in soccer (1), and the functional differences between both legs during functional tests and injury risk or return to sport (2), there is little information on the unilateral jumping performance in soccer players. The aim of this study was to compare the unilateral vertical jump performance with the dominant and non dominant leg of male soccer players. Additionally, leg asymmetries between dominant and non-dominant legs during unilateral vertical jumping were assessed.

METHODS

Twenty male soccer players (22.80 ± 2.71 years, 1.88 ± 0.06 cm, 76.47 ± 8.80 kg) competing in the Spanish Third Division Soccer League participated in this study. The study was conducted according to the Declaration of Helsinki (2013) and it was approved by the local ethics committee. The Soccer Club to which participants belonged gave consent to undergo the study. Participants performed 3 countermovement jumps (CMJ) on a force platform sampling at 500 Hz (Quattro Jump, Kistler, Switzerland) with the dominant (CMJD) and non-dominant leg (CMJND).

RESULTS

Significant differences between dominant and non-dominant leg were found in vertical jumping height (CMJD = 0.42 ± 0.03 m, CMJND = 0.43 ± 0.03 m, $p < 0.05$, $d = 0.33$), and velocity of the take-off (CMJD = 2.06 ± 0.14 $m \cdot s^{-1}$, CMJND = 2.12 ± 0.13 $m \cdot s^{-1}$, $p = 0.05$, $d = 0.42$). No significant differences between both legs were found in the timing and magnitude of the vertical ground reaction force characterizing the landing phase. Mean symmetry index scores showed small deficits (-4.55% to 4.71%) for all jump assessments.

DISCUSSION

Unilateral vertical jump performance has been widely studied in the scientific literature, particularly in team sports such as soccer (3, 4). In the present study significant differences between dominant and non-dominant leg were found in vertical jump performance. Similarly, Menzel et al. (4) found significant differences in vertical CMJ jump height values in Brazilian professional soccer players. Our results contrast with those obtained by Castillo-Rodriguez et al. (3) who found similar vertical jump height values in both legs (CMJD = 19.29 ± 3.06 cm, CMJND = 19.94 ± 3.86 cm). An incomplete rehabilitation from an injured leg, the soccer specific motor demands and the different training methods (4) might be possible causes of the functional asymmetries between legs during CMJs.

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INFLUENCE OF THREE RECOVERY METHODS ON MUSCLE FATIGUE AND RATE OF PERCEIVED EXERTION

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INTRODUCTION

Previous studies have investigated the recovery interval (1) and the exercise order (2) effectsin muscle fatigue (1) and also in the rate of perceived exertion (2). The aims of this study were:i) to verify which of three recovery methods promote better muscle recovery between sets of strength exercises in young males; ii) to verify which of three recovery methods promote lower post-exercise rate of perceived exertion (RPE).

METHODS

Before the beginning of the study the subjects and their parents were notified and informed about all procedures, possible risks and discomforts associated with testing, and signed an informed consent according to the Helsinki Declaration (2008). All subjects completed medical and physical activity questioners to verify the absence of disease or limitation. Ten young males attending a public High School (age = 16.10±0.74 years; body mass =62.69±8.56 kg; height = 171.60±6.29 cm; and stage 4, at Tanner scale) were submitted randomly tothreedifferent strength exercise sessions with a 72 hours interval between them. The three sessions differed on the recovery method that was used (standing, walking and stretching). In each testing session, two sets of two exercises (Squat and Bench Press) were performed with 70% of 8-RM until exhaustion. Exercise order was the same in every testing. RPE was measured during each and every exercise set with the OMNI-RES Scale. Repeated-measures *ANOVA* and a Bonferroni post-hoc test were conducted for after the appropriate mathematical assumptions were verified. Significance level was maintained at 5%. The Institutional Research Ethics Committee approved the study.

RESULTS

The results show that there was a similar decrease in the number of repetitions from the first to the second setat both exercises, regardless of the recovery method that was used. In addition it was found similar increase in RPE form the first to the second set at Squat exercise, regardless of the recovery method. As to the Bench Press exercise, the RPE did not increased from the first to the second set when recovery was performed with walking ($P<0.05$).

DISCUSSION

The results indicate that there are no differences between passive or active recovery when performing high-intensity exhaustive Squat exercise multiple sets. Contrarily, the results suggest a possible mental benefit (as shown by a lower RPE) from active recovery (walking) after high-intensity exhaustive Bench Press exercise.

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Poster

GENDER DIFFERENCES IN THE KNEE MUSCULATURE FUNCTION IN PROFESSIONAL VOLLEYBALL PLAYERS

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INTRODUCTION

Muscular morphology and function differences in professional female and male volleyball players may play a key role in performance and predisposition to injury(1). The knee joint is an anatomical area of great importance in volleyball performance, and a precise assessment of the muscular structures involved in this area might help to understand and prevent injuries associated with this sport (2). The aim of this study was to analyze the gender differences of the knee musculature on high performance volleyball players using Tensiomyography (TMG)(3).

METHODS

A total of 166 professional players were assessed: 83 women (23.99 +/- 5.07 years, 178.13 +/- 7.29 cm and 71.99 +/- 8.87 Kg) and 83 men (25.87 +/- 4.81years, 191.26 +/- 7.36 cm and 87.71 +/- 9.27Kg) from16 teams in the Spanish women's and men's Superleague (8 each). TMG was used to assess the knee flexor-extensor musclesVastus-Medialis (VM), RectusFemoris (RF), VastusLateralis (VL) y Biceps Femoris (BF). Maximal radial deformation (Dm), delay time (Td), and contraction time (Tc) were analyzed.

RESULTS

Data obtained in both lower limbs show a greater rigidity (Dm) on BF ($p \leq 0.001$) in males, and lower rigidity in the extensor muscles [RF, VM y VL ($p \leq 0.05$)]in males compared to females. Delay time (Td) was lower in males on BF ($p \leq 0.001$), RF ($p \leq 0.001$) and VL ($p \leq 0.05$), and only for VM (right leg $p \leq 0.05$)in females.Contraction time (Tc) on BF ($p \leq 0.001$) and VL were lower for males, while itwas similar for both genders on RF, and lower for females on VM (right leg $p \leq 0.05$).

DISCUSSION

Our findings are consistent with previous results reported by Diez et al (2) and with the differences found on BF reported by Rodríguez-Ruiz et al (3). Moreover, the results obtained on VM in females reinforce the stabilization role of the knee joint musculature compared to males (4). However, further research is needed in order to determineother biomechanical aspects of the knee musculature in professional male and female volleyball players.

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Poster

BETWEEN-SESSION STAR EXCURSION BALANCE TEST RELIABILITY IN SCHOOL PRIMARY STUDENTS

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INTRODUCTION

Dynamic balance is required in daily and sport activities. Star Excursion Balance Test (SEBT) is a cost-effective test that has demonstrated the ability to assess dynamic postural control and to predict injuries in the lower extremity (1). Despite SEBT has showed moderate (2) and high (3, 4) reliability in young and adults, no study has proved the reliability in children.

METHODS

Eight healthy participants (10.1±0.3 years) were tested in two different times with two weeks of separation and measurements were performed at the same time of the day by the same researchers. Before performing the test, subjects were informed about the aim of this study and the test procedure by using verbal and visual demonstration. The SEBT was performed in three directions (anterior, posteromedial and posterolateral). Participants undertook the testing barefoot with the stance foot aligned at the most distal aspect of the toes for anterior direction and the most posterior aspect of the heel for the backward directions (1). During trials, hands were placed on hips and minimal stance foot movement was allowed (1). Four practice trials were performed in each direction before recording 3 additional measured trials (4). Leg length was measured with participants lying supine and was used to normalize excursion distances (5). A trial was discarded and repeated if participants used the reaching leg for a substantial amount of support at any time, removed the foot from the center of the grid, or were unable to maintain balance (5).

RESULTS

Intraclass correlation coefficient values for raw and normalized scores showed fair to good reliability (0.65 to 0.88) and standard error of measurement values for raw and normalized scores ranged from 1.84 to 5.90.

DISCUSSION

SEBT is a reliable measure in school primary students. Similar results have been reported previously in young and adults (2,3, 4). Therefore, SEBT may be used as a reliable test in school primary students in order to assess dynamic postural control.

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Poster

CHARACTERIZATION OF HEALTH FITNESS AS MOTOR DYSFUNCTIONS INDICATOR: PILOT STUDY IN ADOLESCENTS OF VALDIVIA CITY (CHILE)

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INTRODUCTION

The balance of components of health fitness it's associated with a lower risk of developing a functional disease and/or disability –ACSM (1) 2005– that keep away people from motor dysfunction defined (2) by López *et al*. (2010) as "phenomenonexpressedbya limitationinthecapacityofmovement of a person at systemicor global level, resulting ina decrease performance or restriction inthe execution ofmotorfunctions oractions considerednormal". Often it's considered a healthy individual when he or she is in a condition free of disease, under the biomedical model. Where a physical assessment by characterizing the motor function contribute to research movement disorders present at early age in children without diagnosed illness, safeguarding the healthy lifestyles that during childhood plays a decisive role in the future health and risk of develop of chronic diseases (3).

METHODS

A descriptive, cross-sectional study. A sample of 105 adolescents participated. Thetestthat characterizedhealthfitness asmovementtranslator wasstrength (dynamometer hand grip, horizontal jump test), endurance muscular (push-up), flexibility (sit and reach test), aerobic fitness (6MWT) and body composition (BMI, Waist-Circumference and Waist-to-Height Ratio).For the descriptive analysis were used abstract parameters as the average and were described percentiles of performance with which graduated individual performance in the Dysfunction Motor Kinesic Index (DMKI)created from the overall performance to confront individual performance and identify the components motors in dysfunction.

RESULTS

The 15% presented obesity condition ad 21% overweight and cardiovascular risk in 21%. There were nodifferences between performances as gender and BMI.4.8% presented a motor function "very bad", 21.9% "bad" and 54.3% "fair," while 18 1% "good" and 0.9% "very good".

DISCUSSION

This study born from the lack of tool that characterize and assessment motor function in Chilean adolescents, where performance is described only by contrast with foreign normal values. Through the characterization of motor function, description in percentiles of performance and status after degree, it was possible identifythe main components altered in adolescents, of generaland personalized way.This tool was calledDMKI.

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NEUROMUSCULAR ADAPTATION OF THE ANKLE MUSCULATUREAFTER FLYWHEEL RESISTANCE TRAINING INFEMALE ALZHEIMER'S PATIENTS

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INTRODUCTION

There are many evidence that lack of strength, or Dynapenia, is a more constant factor in compromised wellbeing in old age and it is apparent that the decline in muscle mass and the decline in strength can take quite different trajectories (1).

The aim of this study was to analyze the neuromuscular adaptation of the ankle musculature in female Alzheimer's patients after flywheel strength trainingusing Tensiomyography (TMG). Rodríguez-Ruiz et al (2) confirmed TMG monitoring of muscle response provides an efficient indicator of loss of quality in dynamic movements involving lower limb muscles. Onambele et al (3) found that quadriceps flywheel loading not only produces a greater increase in power than weighttraining but its physiological benefits also transfer/overspill to the plantarflexor muscle–tendon unitresulting in a significantly improved balance.

METHODS

A total of 12female Alzheimer's patients(age: 77.83±3.24; body weight: 61.00±12.03; height: 153.92±5.73) were assessedusing TMG in ankle musculature: Anterior Tibialis(TA), Medial Gastrocnemius (GM) and Lateral Gastrocnemius(GL). Maximal radial deformation (Dm), delay time (Td), and contraction time (Tc) were obtained for each muscle before starting the intervention program (pre-assessment) and after completing 24 sessions divided into two sessions per week and 3 sets of two minutes of flywheel resistance training with Yo-Yo system leg press (post-assessment).

RESULTS

The results obtained in the study subjects have shownneuromuscularadaptations of the ankle musculature in both lower limbs after flywheel inertial training. GL, GM and TA showedimprovements in post assessment at all parameters evaluated. GM and GL presented significant statistical difference ($p \leq 0.05$) in Tc and Td for right limb, and Tc for GM left limb too. TA has shown lower valuesat all parametersand significant statistical difference ($p \leq 0.05$) in Dm for both limb and Td right.

DISCUSSION

TMG results have shown that adaptations to training are achieved differently for ankle extensor and flexor muscles in both limbs after flywheelinertial training. GM and GL showed better improvement in right ankle for Td and Tc, and TA for Td in this limb, demonstrating better adaptations due to the dominance of the sample. Onambele et al (3) said that appears to be reasoned through an overspill of loading to the plantarflexor muscleswith the flywheel resistance training with Yo-Yo system leg press.

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Poster

JUMP CAPACITY ASYMMETRY OF THE LOWER LIMB IN HEALTHY ATHLETES: SYSTEMATIC REVIEW

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INTRODUCTION

In order to determine the potential risksof injury and to optimize sport performance the lower limbpower asymmetry was widely studied (1).However, the determination of physiological normal value of functional strength imbalances remains relatively unexplored among healthy athletes (2,3).Taking this into consideration, the aim of this systematic review was to summon up the physiologic differencesin jump capacity between both legs in healthy athletes found in previous literature.

METHOD

The systematic search was carried out in the database PUBMED including publications fromthe earliest record to January 1th, 2014. The inclusion criteria of the systematic review were: (a) transversal studies, (b) healthy athletes, c) studiesthat measure the Symmetry Index (SI: % performance difference between both legs) in jump capacity using unilateral jumps. Table 1 shows the algorithm of search. Articles included in the study were distributed among five reviewers, in such a way that every article was reviewed by two of them, who collected data independently.

RESULTS

Of 1402 potential articles20 were reviewed in full text. Only 9 articles meet the inclusion criteria including 423 participants (age 20.81 ± 4.34 years; 67.14% males; 11.34% elite players). Table 2 shows studies characteristics. Only five of the studies included showed significant difference between legs regarding jump capacity. Due to the high heterogeneity among the jump assessments, this study only could calculate the mean SI in single leg vertical jump test (peak force 7 % ± 4,2; distance 9,1% ± 1,8; and maximal force 7,8 %± 0.9). Furthermore, to analyze data, only twoof the included articlesdetermined the dominant leg using objective outcomes (the leg with better jump capacity). The rest of the articles describedit subjectively (preferred leg for kicking, jumping).

DISCUSSION

Given the small number of studies and the poor homogeneity of assessments, this study couldn't calculate physiological normal value of SI injump capacity in healthy athletes. Nevertheless, there is a tendency of a 7-9% threshold of unilateral vertical jump asymmetry, depending on the analyzed outcomes. In relation to these findings, it isworth to notice that the most researchers suggest a 10-15% threshold of muscle asymmetry between legs to be considered as the physiological usual difference (3). Finally, in regard tofuture studies is important to achieve consensus for choose thedominant leg, since in data analysis, the results could differ.

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Poster

RESPIRATORY AND MUSCULAR PERCEIVED EFFORTS AFTER OFFICIAL GAMES IN PROFESSIONAL SOCCER PLAYERS

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INTRODUCTION

Perceived exertion (PE) has been widely applied to quantify the training load (TL) during practice sessions in soccer (1, 2). However, only a few studies have evaluated PE after official soccer matches, specifically using overall PE and in young soccer players (2, 3). Thus, the aim of this study was to assess the respiratory and muscular PE after official soccer matches in professional soccer players.

METHODS

Seventeen Spanish outfield professional soccer male players (age = 20.5 ± 1.8) belonging to the younger team of a professional elite first division club participated in this study. The study was conducted according to the Declaration of Helsinki (2013). During in-season competitive period (23 matches and 170 occurrences) players rated their perceived level of exertion, at least 10 min (5) after the end of fully played official league game (>90 min), using Foster's 0-10 scale (4) and being allowed to mark a plus sign (interpreted as 0.5 point) (4). Specifically, they rated their levels of exertion separately for respiratory (PEres) (6) and leg muscular efforts (PEmus) (6).

RESULTS

Professional soccer players rated the official soccer match as "very hard", PEres = 6.6 ± 1.1 and PEmus = 6.9 ± 1.3. The players systematically rated PEmus higher than PEres (p = 0.00; d = 0.31) after the official matches.

DISCUSSION

To our knowledge, this is the first study that rates respiratory and muscular PE separately in professional senior player after matches. Professional senior soccer players declared a greater feeling of strain in the leg muscles in comparison to the respiratory PE after playing a whole official game of soccer.

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Poster

ISOINERTIALEXERCISE DOES NOT CAUSE CLINICALLY SIGNIFICANT MUSCLE DAMAGE: A PILOT STUDY

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INTRODUCTION

Eccentric exercise has often been associated with skeletal muscles structural damage and athletes may experience signs and symptoms such as limited range of motion and muscle soreness of the muscles across the joint. The isoinertial modality provides additional eccentric load (1). To our knowledge, no previous study has investigated the effect of isoinertial exercise, which consists of both concentric and eccentric muscular actions, on exercise-induced muscle damage. Aim of the present study is to measure changes in exercise-induced muscle damage and soreness as result of one isoinertial concentric-eccentric maximal exercise session.

METHODS

Six healthy amateur football and gaelic football players (3 males, 3 females, age 21.7±0.7 years, mean±SD; height 173.6±8.6 cm;weight 70.3±11.2 kg;training volume 3.5±1.7 sessions/week) volunteered in this study. DOMS was assessed using a Graphic Pain Rating Scale, GRPS, (2). Serum Creatine Kinase (CK) was measured from blood samples using kits for Randox Daytona Analyzer (Randox Laboratories Ltd., Co. Antrim, UK). CK and Delayed Onset Muscle Soreness, (DOMS) were assessed at baseline, 24 hours, 48 hours and 72 hours after a training session consisting of 4 sets of 7 maximal repetitions of a standing-semisquat exercise using a flywheel equiment (Desmotec, Italy), starting with the knees flexed. The inertial mass of the flywheel was 1.8 kg and its radius 0.143 m.A similar training session performed 2/3 times a week for 5 weeks has improved strength and increased muscles's size (3).

RESULTS

Baseline CK levels ranged from 71 to 303 IU/l (n=6, 136±95.6 IU/l). Peak CK, i.e. the highest values measured in samples collected 24, 48 and 72hours after the training session, was 204.0±88.0 IU/l, significantly higher than baseline CK (p=0.029). Values as Mean ± Standard Deviation. All the participants did not experience DOMS ("no pain" in the GPRS scale) after the training session.

DISCUSSION

Isoinertial training does not cause a clinically significant muscle damage and athletes undergoing such a training do not experience DOMS. In conclusion, isoinertial training using a flywheel device is safe and it stimulates muscles in a way similar to other forms of training.

ACKNOWLEDGMENT

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CARDIOPULMONARY RESPONSE DURING ONE SESSION OF MAXIMAL ISOINERTIAL TRAINING

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INTRODUCTION

The use of the flywheel resistance training has been shown to provide an increased eccentric muscle loading (1) and improve strength (2). Little research has been carried out on the effects the flywheel strength training session has on the cardiopulmonary system (3).The aim is to assess cardiopulmonary responses in amateur footballers undertaking isoinertial training.

METHODS

8 healthy male amateur footballers (age 19.5±2.3 years, weight 73.6±5.2 kg, height 180.4±5.2 cm) participated in this study. The inertial mass of the flywheel was 1.8 kg and its radius 0.143 m (Desmotec, Italy). The subjects performed 4 sets of 7 maximal repetitions, as per protocols shown to be effective to improving strength (2). After a familiarisation session, they were told to bend their knees down to 90 degrees flexion, stop the flywheel and extend at maximum speed, starting from a semi squat position. They were allowed to rest for 30 seconds between sets. Cardiopulmonary parameters were measured continuously throughout the test, oxygen uptake (VO_2) and carbon dioxide (CO_2) measured breath by breath by a portable gas analyser (Cosmed K4, Italy). The HR was measured by a heart rate monitor (Polar, Finland) throughout the test and blood lactate samples was taken from the earlobe at the end of the session and 3 and 5 minutes post completion of the four sets of exercise (LT-1710, Arkray, Japan). The highest value of lactate concentration was included in the present report.

RESULTS

The average (± standard deviation) values recorded in our athletes during an isoinertial training session were as follows: Heart rate was 126.5 ± 18.4 beats per minute, VO_2 (mlO_2/min/kg) was 22.65 ± 2.60, respiratory quotient was 0.92 ± 0.08, blood lactate concentration was 2.53 ± 1.36

DISCUSSION

According to our preliminary data an isoinertial intermittent training session elicits cardiopulmonary responses within the aerobic range of metabolic intensities. Further research will focus on cardiopulmonary responses to different isoinertial masses and protocols.

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Poster

RELATIONSHIPS BETWEEN WARM-UP EFFECTS AND SWIMMING PERFORMANCES

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INTRODUCTION

The warm-up activities are commonly used to increase athletes' preparedness and to optimize performance (1). Although recent findings showed positive effects in swimming performance after habitual warm-up procedures (2), the main causes for this to happen are still unclear. Therefore, it is essential to analyze the relationship between the effects of priming activities and performance, to better understand warm-up procedures in competitive swimming.

METHODS

Thirty-six male swimmers of national level, with at least 6 years of competitive training experience participated in this study. After a standard warm-up and 10min rest the swimmers performed 100 m freestyle at maximal intensity, in a randomized order. The warm-up included a set of aerobic capacity, kick and drills exercises and a set at the race pace, in a total of 1200 m.The relationships between performance (race time) and the physiological (capillary blood lactate concentrations, auricular temperature, heart rate) and psychophysiological (rate of perceived exertion) variables obtained after warm-up were calculated using the Pearson correlation coefficient.

RESULTS

Blood lactate immediately before the race waspositively related with 100 m time ($r=0.37, p=0.03$). Also, heart rates assessed after warm-up were moderately related with 50m first partial ($r=0.44, p=0.02$) and with 100m ($r=0.53, p<0.01$). The correlation coefficient determined between the ratings of perceived exertion and 50m ($r=0.34, p=0.04$) and 100m ($r=0.37, p=0.03$) revealed a moderated relationship. Nevertheless, auricular temperature was not related with swimmers performance.

DISCUSSION

The higher heart rate at the start of the exercise potentially increases the baseline oxygen consumption(3) and helps to get better performances. However, the results suggested that the fastest swimmers were those who had lower heart rate values and blood lactate concentrations before maximal trial. The relationship between the perceived exertion and performances could indicate that the swimmers with higher values accumulated some fatigue and consequently had inferior performances. These relationships may be useful to coaches to prescribe warm-up procedures, being aware of the risk of fatiguing the swimmer.

SUPPORTED

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Poster

THE TIME LIMIT. A TOOL TO INDIVIDUALIZE THE HIIT SESSIONS? A REVIEW OF LITERATURE

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INTRODUCTION

Keys of training can be found in the methodology that champions used to employ in the past. Once Zatopek said: "I do 60 times 400 meters and I recover in intervals of 100m. I called it interval training". Nowadays, exercise physiologists agree with him. Thus, it can be dispensed the traditional continuous method (after 2 months of work) in order to train more intensively and less time. As training methods are related to aerobic performance, it is important to know the parameters that affect it: maximal oxygen consumption, lactate and ventilatory thresholds, running economy and kinetics of oxygen uptake. High-Intensity Interval Training (HIIT) is positioned as one of the bests methods to achieve improvements in those 4 parameters and is defined as short-to-long bouts of high-intensity exercise interspersed with recovery periods which could be light exercise or passive rest.

METHODS

We reviewed the actual literature and we focused on 4 parameters: intensities of work and recovery (both defined by % of vVO_{2max}), durations of work and recovery. We also searched the best way to individualize those parameters.

RESULTS

Time limit utilization allows spending maximum time at VO_{2max}, this fact is going to enhance the values of it and therefore, the aerobic performance. Few studies to our knowledge have been realized with the time limit. However, all of them indicate improvements in vVO_{2max}, time limit and performance in 3000 and 5000 meters. The duration of work will be individualized by a fraction of the time limit and the recovery duration depending athlete's level through the ratio, schematically, 1:2 beginners, 1:1 active and 2:1 high-level.

DISCUSSION

The time limit seems to be an important tool for the individualization of HIIT due to two factors: 1) Intensity used is linked with the VO_{2max} of each subject. 2) Interval duration is associated with the individual time limit. Although it is a training method that has not been studied much, it could be affirmed that the utilization of the time limit and vVO_{2max} allows improvements in trained athletes. Consequently, is a training method really interesting for elite athletes.

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Poster

THE EFFECT OF SET CONFIGURATION AND TYPE OF RESISTANCE EXERCISE ON RECOVERY BLOOD PRESSURE

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INTRODUCTION

A single bout of aerobic exercise can lead to a post-exercise decrease in blood pressure, called post-exercise hypotension (PEH). In resistance training, despite various studies that evaluated the role of different intensities and volumes, effects on recovery blood pressure (BP) still remain unknown. To our knowledge, the effect of set configuration on recovery blood pressure was not studied in resistance exercise. The aim of this study was to analyze the effect of set configuration and type of exercise on recovery BP.

METHODS

Ten normotensive colleged-aged students (23.7±1.7 yr; 1.72±0.07 m; 68.16±8.87 kg; SBP: 108.22±7.47 mmHg; DBP: 61±8.1 mmHg) with previous experience in resistance training were evaluated in three set configurations and a control session (CS) in two resistance exercises. 10 repetitions maximum (RM) was determined twice for bench press and parallel squat. In a semi-counterbalanced design, subjects performed 5 maximal sets with the 10RM load with three minutes between sets (Failure Session, FS). With the repetitions performed in FS and their total rest (720 s), subjects performed a session with rests between each repetition (1S) and a session with groups of 5 repetitions (5S). Total rest of FS was distributed between each repetition (1S) or cluster of repetitions (5S) guaranteeing the same work-to-rest ratio for all sessions. SBP and DBP were measured in a seated position with an oscillometric device before and after each session during 40 min in epochs of 10 min. Data was analyzed using a 3-way ANOVA with repeated measures (Session x Exercise x Time) with a significance level set at 0.05.

RESULTS

A main effect was observed for Session for SBP and DBP. Pairwise comparisons revealed that SBP was lower in FS in comparison with CS. Significant interaction between Exercise x Time was detected for DBP, revealing higher values for bench press respect to parallel squat after the firsts 10 mins of recovery.

DISCUSSION

Since normotensive population have a reduced PEH and the low total volume used in this study, PEH was not observed (Polito & Farinatti, 2009). FS, the more demanding protocol, had a lower session SBP in comparison with CS, suggesting that recovery BP could be affected by set configurations with more metabolic stimulation. Also, the differences between exercises in DBP after the first 10 min of recovery could indicate that recovery BP can be affect by the exercise performed, as reported previously (Polito & Farinatti, 2009).

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RATE OF CARBOHYDRATE USE VARIABILITY AT MARATHON PACE IN ENDURANCE RUNNERS

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INTRODUCTION

Carbohydrate (CHO) is a critical fuel for prolonged muscle contraction, however the body's ability to store CHO, primarily in the form of liver and muscle glycogen is relatively limited and with the exhaustion of carbohydrate reserves performance decrements are inevitable. The amount of glycogen stored in muscle and liver whether a recreational athlete or an elite competitor limited to 400 – 600 g. The rate of CHO utilization (rCHO) ranges from 1 - 5.8 $g.min^{-1}$ in prolonged submaximal running (60-80%VO_2max) and can be decisive for the duration of submaximal effort before depletion of the limited CHO reserves. There are, however, no systematically collected descriptive data regarding the rCHO metabolism during low intensity prolonged marathon pace (MP). The aim of this study was to investigate the rate of CHO usage at mean marathon pace (rCHOmp).

METHODS

Trained (n=167) male runners (age 41 ± 7.9, weight 79.4 ± 8.14, and VO_2max 59.62 ± 6.72) performed, 7-21 days before a marathon race, an incremental test (0% inclination, 3 min stages until RER 1.0 then 2 min stages to volitional fatigue) to determine VO_2max and ventilatory threshold (VT). Fat, CHO oxidation and energy expenditure were calculated using stoichiometric equations (Fryan, J.A.P., 1983). Mean marathon pace ($km.h^{-1}$) was also used for analysis.

RESULTS

Mean ± sd rCHOmp, %VO_2max at MP and MP were 3.1 ± 0.81 $g.min^{-1}$, 78.04 ± 2.38 and 11.75 ± 1.89 $km.h^{-1}$ respectively. The marathon performance range was 2h:16 min :35 s - 5h: 15 min: 48 s. The rCHOmp ranged from 1.5 – 5.8 $g.min^{-1}$ with a coefficient of variation (CV) 26.03%. Low correlations ($p>0.05$) were found between rCHOmp with MP and VO_2max.

DISCUSSION

The results of this study indicate that individual evaluation of the rCHOmp in male marathon runners may help them to design the strategy of exogenous CHO intake and prevent early depletion of CHO availability and performance deterioration.

Poster

EFFECT OF A BOUT OF STRENGTH EXERCISE UNTIL FAILURE ON HEART RATE VARIABILITY

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INTRODUCTION

Heart rate variability (HRV) is one of the most promising non-invasive measures to provide additional valuable insight into physiological conditions associated to the functioning of the autonomic nervous system (ANS). There are many studies about the relationship between aerobic exercise and HRV response. However, there are few references which have considered the effect of bout of strength exercises on HRV. This study aims to analyze HRV at rest and while performing a strength exercises, to establish the relationship between changes in HRV and physical work in a short period of time.

METHOD AND DESIGN

17 soldiers of the Spanish Army (age = 33.7±4.5), underwent assessment of HRV at rest and during a strength exercise. The HRV signal was analyzed in time and frequency domains. Participants came to the laboratory in two sessions: Session 1: Testing session to determine the load 1-repetition maximum (1RM) and linked to Maximal Power (P_{max}), and Session 2 (after 48-72h rest): Strength Exercise Session: Six sets of repetitions until failure with three power loads: 1. Loading 15% lower than P_{max}, 2. Burden related to P_{max} and 3. Loading 15% higher than P_{max}.

RESULTS

During rest condition, soldiers presented higher values when compared to values in exercise for the variables SDNN [53.23 (19.54) vs. 48.57 (18.18)], RMSD [57.55 (28.36) vs. 37.45 (21.36)] and pNN50 (28.94 (21.05) vs. 13.05 (12.15)], as well as lower values of LF_{nu} [(54.74 (18.12) vs. 79 82 (8.95)], HF_{nu} [45.26 (18.12) vs. 20.18 (8.95)] and LF/HF [1.70 (1.42) vs. 4.92 (2.41)], but these differences did not reach the statistical significance. More importantly, we found a significant increase from rest to exercise condition in LF / HF ($p < .001$) and a decreased value of RMSSD ($p = .002$) and pNN50 ($p = .002$).

DISCUSSION

In line with other studies (1, 3) we found a significant increase in LF / HF during the performance of high intensity exercise compared with rest, which is an indicator of activation of the sympathetic nervous system (SNS). By contrast, RMSSD and pNN50 temporary components reduced under strength exerciseconditions. This data pattern indicates a reduced parasympathetic activity (2). HRV can be anuseful indicator to coaches and athletes formonitoringshort term training effect.

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RATE OF CARBOHYDRATE USAGE VARIABILITY AT MARATHON PACE IN ENDURANCE FEMALE RUNNERS

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INTRODUCTION

As carbohydrate is a critical fuel for prolonged muscle contraction,the ability of the bodyto store carbohydrate is essential for the final outcome, whereas the exhaustion of these reserves leads to performance deterioration. The amount of glycogen stored in muscle and liver is limited to 400- 600g (depending on level of the performer), where the rate of carbohydrate utilization ranges from 1-5.8 $g.min^{-1}$ in prolonged submaximal exercise (60-80%VO_2max). However, there is however no systematically collected descriptive data regarding the rate of carbohydrate utilization during low intensity prolonged marathon pace. The aim of this study was to investigate the rate of CHO usage at mean marathon pace for female athletes.

METHODS

One hundred and one trained female runners (age =37.78 ± 7.73 years, mass= 57.40±7.01 kg, height = 165.12 ± 5.18 cm, % body fat = 20.17 ± 4.60 %, and VO_2max 50.27±7.24 $mlkgr^{-1}min^{-1}$) performed, 7-21 days before the marathon race, an incremental test (3 min stages until RER 1.0 then 2 min stages to volitional fatigue, 0% inclination) to determine VO_2max and the ventilatory threshold. Fat and CHO oxidation and energy expenditure were calculated using stoichiometric equations (1). Mean marathon pace (kmh^{-1}) was also used for analysis.

RESULTS

The mean ± SD marathon time was 3:58:26 ± 00:43:53, ranged from 02:48:47 to 07:01:57 with coefficient of variation (CV) = 18.4%, the mean marathon pace was 10.93 ± 1.80 kmh^{-1}, ranged from 6.0 to 15.0 km $h^{-1}$and CV = 16.4%, and the carbohydrate utilization was 2.07 ± 0.57 $g.min^{-1}$, ranged from 1.01 to 3.90 and CV = 27.4%. Correlation coefficient between carbohydrate utilization and marathon time, mean marathon pace and VO_2max were -0.40, 0.47 and 0.38 respectively. When the group divided according to the marathon time, the carbohydrate utilization for good (marathon time <03:30:00), medium (04:40:00 > marathon time >03:30:00) and novice (marathon time > 04:40:00) runners were 2.36 ± 0.58, 2.08 ± 0.55 and 1.72 ± 0.41$g.min^{-}$(1).

CONCLUSIONS

The results of this study showed that individual evaluation of the carbohydrate utilizationin female marathon runners is required in order to design the strategy of exogenous carbohydrate intake and to ovoidthe early fuel depletion for better performance.

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Poster

NUTRITION STATUS OF THAI NATIONAL TEAM WEIGHTLIFTERS

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INTRODUCTION

Weightlifting is one of the most powerful athletic activities in the world of sport. In Thailand, weightlifting is the most successful Olympic sport along with boxing. It is one of the only two sports in which Thailand has won gold, with three weightlifting gold medals won in the last three Olympic Games. Weightlifting demands extreme strength and power to lift very heavy weights in a controlled manner. The aim of these athletes is to build muscle bulk and target the main muscles that are used for the bar movement. A high level of muscularity is therefore required by both male and female competitors. Maintaining low body fat is also a physical requirement often demanded to optimize the power to weight ratio of lifters, helping to achieve best performance (1). Besides providing the energy for training and for its recovery, nutrition also promotes training adaptations, including skeletal muscle hypertrophy (2). The aim of this study was to diagnose the nutritional status of Thai Weightlifters.

METHODS

The sample was composed of 37 weightlifters, aged 15-24 yr, 18 males (17.9± 2.8 yr) and 19 females (18.7± 2.6 yr). They completed anthropometric assessment, 3-day food record analyzed for macro- and micronutrient intake. In order to report the result as accurately as possible, the researchers took a photo of all the food that subjects had been eaten and weight the items using a weighing scale. Energy expenditure was estimated using predictive equations (factorial method).

RESULTS

Mean percent fat was 11.6±3.4 and 20.6±6.0%, body mass index was 25.7±2.8 and 25.8±5.6 kg/m^2 for men and women, respectively. Mean energy intake was 2,655±270.6 and 2,150±282.8 kcal/day, estimated energy expenditure was 2,953.7±318.0 and 2,459.7±350.3 kcal/day for man and woman, respectively. Of the athletes, 22.2% of men and 31.5% women consumed <4 g/kg carbohydrate, 66.6% of men and 63.1% of women consumed <1.6 g/kg protein, 11.1% of men and 31.5% of women consumed > 35% of energy intake from fat. A large population of athletes did not meet Thai Recommended Daily Intakes: Thai RDI for vitamin B, vitamin C, Calcium, Phosphorus, Iron, Potassium, Sodium, Zinc, Copper, and Magnesium.

DISCUSSION

A high proportion of weightlifters were not in energy balance, and so, failed to meet carbohydrate, protein and micronutrient recommendations. Suboptimal nutrition status may affect weightlifting performance and physiological development. More research is needed to understand the unique nutrition needs of this kind of athletes and inform sport nutrition practice and research.

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Poster

EVALUATION OF THE NUTRITIONAL INTAKE OF SOCCER REFEREES

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INTRODUCTION

He human being has been interested in the relationship between eating habits and health since the origins of mankind (1). This worry covers several fields, from elite athletes who are trying to win a medal in the Olympics, to the person who practices sports just to keep fit (2). There is no complete perfect and magic food (3). For this reason, every sportsperson who may want to reach a higher endurance exercise, must pay special attention to their own eating habits. This includes the referees who play an outstanding role in sport and who must keep up with the players. In conclusion, the sports endurance capacity is linked to the proportion of elementary food ingredients in the daily diet.

OBJECTIVE

Analyze the habits and attitudes of a group of soccer referees and assistants.

METHODS

A nutritional study of 35 soccer referees (18-50 years) from different levels of arbitration was conducted (from 3rd division Spanish soccer to categories-7) analyzing intake, body composition and distribution of macro-micronutrients and dietary fiber depending on type of day (normal, training and competition).

RESULTS/DISCUSSION

There are no significant differences in caloric intake as regards the type of day (normal training and competition) in absolute values (2.371 kcal vs. 2479 and 2368 kcal, respectively) referring to body weight (32,4 kcal/kg vs. 33,9 and 32,4 Kcal/kg respectively). Regarding macronutrient intake and, more specifically carbohydrates, the tester consumes a diet with an insufficient amount of carbohydrates (278 g vs. 371 and 540 recommended according to the physical activity). A slight increase is observed on the day of the competition but without being significant. The analysis of micronutrients shows that 3 Vitamins (B6, B12 and C) are above the recommended quantity. Finally, the amount of Ca, Mg and Fe and Fibre obtained are close to the recommended values independently of the type of days studied.

CONCLUSIONS

This study presents that the group of referees under this study consume a diet which lacks enough carbohydrate calories for their profession. This poor nutritional status may interfere with the development of their sporting performance and ultimately increase the risk of injury. This implies the need to design and enlarge the diet and the introduction of nutrition education programs for these athletes.

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Poster

CAN NUTRITIONAL INTERVENTION BY SPORT NUTRITIONIST MODIFY THE EATING HABITS OF ONE PROFESSIONAL BASKETBALL PLAYER?

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INTRODUCTION

Scientific evidence shows that professional basketball players perform inadequate nutritional intake compared to recommendations and researchers claim that nutritional intervention could improve this food pattern (1).

OBJECTIVES

Carry out a long term nutritional intervention in order to improve body composition (BC), dietary intake (DI) and nutritional knowledge (NK) of one professional basketball player.

METHODS

A single-case design study was carry out with one professional basketball player (point guard) of the Spanish ACB League, healthy, Spanish, 25 years, 87,6 Kg body weight (BW) and 1.87 m height. Declaration of Helsinki was met and informed consent was signed. Nutritional intervention (3 months) was employed. Pre and post intervention: sports NK survey (Reilly & Maughan 2007) was applied (statistical analysis: Wilconson test), 7-day food record was used to assess DI and anthropometric measures (ISAK) were taken.

RESULTS

BC: the athlete lost BW (87.6 vs. 86.8 Kg) and BF (Σ8 skinfolds = 69.3 vs. 64 mm; % BF = 11.2 vs. 10.8% (Yuhasz 1963)) after intervention. *DI*: Pre intervention: total daily energy intake (TDEI) was below total daily energy expenditure (TDEE) (3520 vs. 4250 Kcal/day), carbohydrates (CHO) intake was low (5 vs.7-12 g/Kg W) and total protein (P) intake was satisfactory (1.4 vs. 1.2-1.7 g/Kg W/day) compared to recommendation and total fat (TF) and saturated fat intake (SFA) were above the maximum limit (36 vs. 20-35% and 13 vs. <10% of TDEI respectively). Post intervention: TDEI (3870 Kcal) met the proposed value, CHO intake (7 g/Kg W/day) reached the minimum requirement, P intake was higher (1.8 g/Kg W/day) and both TF and SFA intake decreased to 21% and 6% of TDEI respectively, all according to fat loss planification. *NK:* There was a statistically significant difference in correct answers pre and post intervention: 53% vs. 70% ($p<0.05$).

DISCUSSION

This player´s DI was inadequate according to Schröder et al (2004) study (1) and nutritional intervention improved his BC, NK and DI like was shown in previous nutritional interventions with athletes of team sports (2, 3). In future research, it will be necessary to prolong the intervention and analyze the relationship between the changes of nutritional practices and BC with sports performance.

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MONITORING OF BODY COMPOSITION OF VOLLEYBALL ATHLETES WITH ANTHROPOMETRY, DEXA AND BOD POD: A COMPARATIVE STUDY

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INTRODUCTION

The main objective of volleyball coaches and sports nutritionists is to monitor corporal body athletes before, during and after the season, in order to prescribe a desirable body weight, to optimize performance and to evaluate the effects of training (1). Due to the increase in muscular mass and the decrease on adipose percentage of a competitive athlete, it has been speculated that conventional methods to determine the body composition are not accurate in this population (2). Therefore our aim is to obtain values of body composition with different methods of measurement.

METHODS

A descriptive longitudinal study was realized with a total of 15 college volleyball athletes (age 22.6 + -3.4, height 189.4 + - 5.4) wich body composition was evaluated at the beginning and end of a training period of 4 months duration composition. Body composition was determined through the indirect method with the team dual X-ray absorptiometer (DEXA) and air displacement plethysmograph (Bod Pod), and twice indirect anthropometry.

RESULTS

From the results of DEXA, showed a significant decrease from the first to the second shot of the percentage of fat mass (p= 0.001), same situation with anthropometry that indicated a significant decrease (p= 0.000) however the equipment Bod Pod showed no significant decreases (p= .245) from the first to the second take.

DISCUSSION

The reason for the difference in the changes in total body mass and lean mass in a period of training are expected to be a required resistace without much weight requirement (4) as reflected in our values, similar results were obtained at the Dan Bernadot (3) even lower values are shown in this study. Moreover, similar to the values of other studies, our data suggest that DEXA and anthropometry can be more precise regarding the Bod Pod. However, we cannot generalize our findings across all sports and genders.

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Poster

DAILY MENU ASSISTANCE SYSTEM: A CASE STUDY FOR THAI WEIGHTLIFTERS

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INTRODUCTION

Olympic weightlifters are quite possibly the strongest and most skilled lifters on earth. While this takes years of dedicated training, diet is also critical as optimal nutrition is essential for peak performance. Besides providing the energy for training and for its recovery, nutrition also promotes training adaptations, including skeletal muscle hypertrophy (1). In Thailand, we found a high proportion of weightlifters that were not meet energy balance, and so, failed to meet carbohydrate, protein and micronutrient recommendations. In this study, we propose ontology-based daily menu assistance system for weightlifting to assist weightlifters meet their requirements.

METHODS

For this study, we need a knowledge based framework and for that, it was developed a unified ontology merging nutrition and sports concepts. Developing the ontology-based framework involves specification and definition of the four main elements such as classes, the individuals, the proprieties and all the relationships. In this case we decided to start with only one specific sport, the weightlifting, by following a top-down approach. We started with the definition of the most general concepts in the domain and then, subsequently, the specialization of those concepts. Such ontology was modeled around four main concepts: Athlete, Food, Nutrition and Sports and it consists of 120 classes, 950 individuals and 25 properties. The rule engine was developed using SWRL Protégé editor (2) with rules based on nutrition and sports knowledge for the recommended energy and nutrients need for specific training types and specific ages, weights, heights etc. (1). The Java application was developed so a user can add all the needed data and then received the specific menus.

RESULTS

The first menu of the user application will be the athlete profile menu where the athlete will add his personal information. For requiring menu recommendations, various variables have to be added both in training part and preferred food. After the submition, it will be possible to received various types of reports like via email or in the application itself . All the user requests together with the profile data will be transformed in a SQWRL query that will question the ontology, producing all the recommendations results following the rules previously saved into the ontology.

DISCUSSION

This study describes a food and nutrition ontology working with a rule-based knowledge framework to provide specific menus for different times of the day and different training phases for the athlete's diary nutritional needs and personal preferences. However, the database supports only Thai food with a limit of type of foods. Therefore, future research should be an evaluation of framework in term of weightlifter nutritional improvement after using the program and database improvement to cover more foods.

The authors acknowledge financial support from Sports Authority of Thailand.

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Poster

FLUID INTAKE DURING AN OFFICIAL FOOTBALL GAME DEPENDING ON THE SPECIFIC POSITION IN CHILD CATEGORY

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INTRODUCTION

Evidence has been found in some studies of team sports, including football, regarding inadequate rehydration performing players during their sport to mitigate the demands of the body (1, 2). The purpose of this study was to determine the fluid intake of young players of the Murcia regional selection in the child category in a competitive match depending on the specific position on the field.

METHODS

Fluid intake was measured in a goalkeeper, five defenders, five midfielders and three forwards in an official match of the soccer team of Murcia child category (N=14; 13.7±0.4 years old). The total fluid intake is the sum of the water and the sport drink (6 +10 Isotonic orange) ingested during activity (warm up and match).

RESULTS

The results show the goalkeeper position was more fluid ingested (total = 312 ml; water = 0 ml, sport drink = 312 ml), followed by midfielders (total = 264±164.99 ml; water = 103±97.46 ml, sport drink = 160±97.15 ml), forwards (total = 253 ± 219.38 ml; water = 118.38±136 ml, sport drink = 117±145.71 ml) and finally the defenses (total = 235±117.56 ml; water = 70±106.49 ml, sport drink = 164±126.87 ml). No significant differences between the different positions analyzed were found (Kruskal-Wallis = 0.974, $p \leq 0.05$).

DISCUSSION

In light of the results found in young players, emphasize the importance of fluid replacement habits in training and matches at these ages to take advantage all the time permitted by the rules and avoid the adverse effects of dehydration.

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Poster

SWEATING RATE DURING AN OFFICIAL FOOTBALL MATCH DEPENDING ON THE SPECIFIC POSITION IN THE CADET CATEGORY

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INTRODUCTION

During a football game, and depending on the time played, sweat loss and sweat rate may vary depending on the specific field position, model of play and the total time spent in the field (1). The purpose of this study was to determine sweat rate achieved by players cadets during an official match depending on the specific field position.

METHODS

The sweat rate was registered to a goalkeeper, six defenders, five midfielders and three forwards in a competitive game of Murcia regional selection in the cadet category (N = 15, 15.6 ± 0.6 years old). The sweat rate was calculated by dividing the body weight loss in pre-and post-game after collecting fluid intake and urine loss, and minutes played.

RESULTS

The results show that the defenses are more players who have achieved sweat rate (14±1.96 ml/min), followed by the goalkeeper (12 ml/min) on the forwards (11±1.41 ml/min) and finally, by midfields (10±1.09 ml/min). No significant differences in terms of the occupied position were found (Kruskal-Wallis = 0.065, $p \leq 0.05$).

DISCUSSION

We conclude, regardless of the specific position occupied in the field and game time, which, due to the variability of the results obtained, this data could be useful in developing individualized hydration strategies taking into account the characteristics of each player.

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Poster

DEHYDRATION LEVELS DURING AN OFFICIAL FOOTBALL GAME DEPENDING ON THE SPECIFIC POSITION IN THE JUNIOR CATEGORY

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INTRODUCTION

The position of a soccer player on the field can influence fluid intake and dehydration levels achieved (1). The purpose of this study was to determine the average rate of weight loss achieved during an official match in the junior category depending on the specific position in the field.

METHODS

The mean percent weight loss has been calculated on a goalkeeper, five defenders, five midfielders and three forwards in an official match of the regional football selection Murcia in the juvenile category (N=14, 17.5±0.5 years old).

RESULTS

The defense position had the highest percentage of weight lost during the game analyzed (1.9±0.24 %), followed by the position of midfielder (1.4±0.61 %), the goalkeeper (0.9 %) and the forward position (0.7±1.50 %). No significant differences were found depending on the specific position in the field (Kruskal-Wallis = 0.376, $p \leq 0.05$).

DISCUSSION

These results suggest that there is great variability in the percentage of weight lost found depending on the specific position in the field. These data indicate the need to address individual differences of each athlete to develop hydration strategies taking into account, among other factors, the occupied position.

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Poster

CHARACTERISTICS OF CHOSEN MUSCLE STRENGTH INDICATORS USING THE "OPTOGAIT" SYSTEM

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INTRODUCTION

One of the more important motor abilities for people playing team games is lower limb muscle strength. This ability allows the implementation of technical and tactical aims according to the game demands, and directly influences components such as (e.g.) running speed and gaining an advantage over the opponent. To date researchers mainly used so-called field test (e.g. vertical or long jump) or dynamometric platforms to assess lower limb strength. However, this has many limitations. Using the "OPTOGAIT" system opens up new opportunities for measurement, analysis and training. Publications on the topic are still rare. The main aim of the investigation was to characterise the level of chosen lower limb muscle strength indicators (power, strength endurance, jumping) of team game players using the "OPTOGAIT" measurement system.

METHODS

Fourteen male field hockey players from the University School of PE in Poznań, Poland Sports Club AZS-AWF participated in the study (mean±SD: age 21.96±1.74 years, body mass 72.8±7.96 kg and height 176.4±3.55cm, %fat 10.9±4.11). Using the "OPTOGAIT" system (Microgate Corporation, Italy) three tests were conducted: "Squat Jump" - power, "Tapping" – strength endurance, "Stiffness" – jumping.

RESULTS

Data analysis enabled the observation of irregular trends among those tested in relation to muscle strength indicators and was observed in most competitors (71.4%). One competitor, however, achieved the expected relationship and achieved the highest results in all the observed variables.

DISCUSION

It was observed that, at a relatively similar sports level, the results suggest possible compensation of one element thanks to another. This could provide important methodological information which should be used during the design of training loads (exercise), taking into consideration the individual abilities of each of the players. The results confirmed the usefulness of the "OPTOGAIT" system to assess different indications of lower limb muscle strength.

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FROM STUDIES ON THE THRUST OF TWO DIFFERENT TYPES OF PASSES IN FIELD HOCKEY

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INTRODUCTION

The authors of this research focus on multidirectional analysis of effectiveness, searching for those elements which were not previously sufficiently investigated. Such variables include various kinematic characteristics of team games players. One of the essential technical skills required by field hockey players is passing the ball. There are many different kinds of passes depending on their aim and/or tactical needs. The two basic ones are - penalty corner drag-flick and forehand push passing. To date researchers have focused their interest on biomechanical analysis of movement structure but there are few publications which examine thrust when passing the ball. The main aim of the investigation was to measure thrust levels of two different passes, in static and dynamic conditions, of academic field hockey competitors.

METHODS

Fourteen male field hockey players from theUniversity School of PE in Poznań, Poland Sports Club AZS-AWF participated in the study (mean±SD: age 21.96±1.74 years, body mass 72.8±7.96 kg and height 176.4±3.55cm, %fat 10.9±4.11). Thrust during both types of passes, penalty corner drag-flick (DF) and forehand push passing (FPP), was tested in static and dynamic conditions. Measurement of thrust [N] in static conditions was performed using a prototype device and to record dynamic force (peak velocity [m^*s^{-1}], a peak power [W]) "TENDO" (TENDO SPORT MACHINES, Slovak Republic) machine was used.

RESULTS

The data analysis showed statistically significant differences between both types of passes and in both observed conditions. In static conditions higher results were noted in FPP than FD [N]. Whereas, in dynamic conditions, higher values were achieved in DF than FPP. Both peak velocity [m^*s^{-1}] and peak power [W] results were higher.

DISCUSION

It was concluded that the results presented in the investigation significantly supplement present knowledge about thrustinstaticanddynamicenvironments.However,toobtain a more detailed picture of effectiveness of activities in field hockey it is necessary to carry out further research with greater numbers of participants. Such work should try to identify relations among static and dynamic types of thrust strength and competitive effectiveness. Results of the study will help determine whether maximal values of observed elements of force or their optimization on an individual level are more important?

Poster

SESSION-RPE IS RELATED TO STRENGTH PERFORMANCE IN HIGH-LEVEL MIDDLE AND LONG-DISTANCE RUNNERS

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INTRODUCTION

Strength training has become an important variable of the training process of high-level middle and long distance runners, since several studies has shown its benefits on some performance determinants like running economy (1, 2). However, the relationship between the endurance training load and the strength performance of such athletes remains unclear.

METHODS

Fifteen high-level middle and long-distance runners from the High Performance Sports Center of Madrid (12 men, 3 women; age = 26.3 ± 5.1yrs.), with personal bests in outdoors 1500-metres between 3:38 - 3:58 min (men) and 4:12 – 4:23 min (women) took part in this study. Squat and 50-meter sprint performance were measured 4 times during the whole training season (October-July), and daily training load was recorded using the session rate of perceived exertion (session-RPE) (3). Mean values of each variable were calculated for the whole season. Then, the correlations between the season mean values of the variables were analyzed using Pearson's correlation coefficient, unilateral contrast. The level of significance was set at 0.05. All calculations were performed using IBM®SPSS® Statistics 22.

RESULTS

Significant correlations between session-RPE and mean propulsive velocity ($r=-0.650$, $p<0.001$), mean propulsive power ($r=-0.602$, $p<0.001$) and Repetition Maximum ($r=-0.650$, $p<0.001$) on squat, and between session-RPE and 50-meter sprint time ($r=0.560$, $p<0.05$) were found.

CONCLUSIONS

Session-RPE has a remarkable relationship with strength performance on high-level middle and long-distance runners. Thus, athletes with higher session-RPE during the season tend significantly to have lower performance on the squat and the sprint. Monitoring training load through session-RPE could help coaches and trainers to control the strength training process in a simple, economic way.

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RELATIONSHIP BETWEEN HAND GRIP STRENGTH AND SHOT SPEED IN DIFFERENT COMPETITIVE LEVEL WATER POLO PLAYERS

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INTRODUCTION

The water polo shot skill, beyond technical and biomechanical constraints, is engaged to the strength capability of the shooter and its ability to grip the ball. This last, is important for the ball release velocity in the throw (1) and fastest shots increase the defensive difficulty to the opponent goalkeeper (2), which can be an advantage for the team who shoots fastest. Since the research about the hand grip strength and its relationship with the shot speed, involving players of different competitive level, is scarce, the present study aimed: (i) to determine whether hand grip strength is related with shot speed and (ii) to observe if there is inequality of those parameters between different competitive level players.

METHODS

Thirty water polo players were recruited from Spain (two primary division teams, n=15) and Portugal (national team,n=15), in two subgroups of players with different European competitive level. Maximal isometric hand-grip strength and throwing velocity in a penalty shot situation (players had five attempts, in a random order; best velocity considered), were assessed (adapted from Alcaraz et al.(2)). The study was drown up according to the Declaration of Helsinki. The Pearson correlation product was used and the comparison of mean values of variables was performed through the independent samples t-test ($p \leq 0.05$).

RESULTS

It was found significant relationship($r=0.36$, $p=0.05$) between hand grip strength and shot speed for the whole sample. Moreover, no differences were found between subgroups in values of hand grip strength, whereas, the shot is faster in Spanish players ($p<0.01$).

DISCUSSION

The relationship between hand grip strength and shot speed had already been found in highly skilled players (3). Our sample comprises players of different competitive level, reinforcing the importance of grip strength for the shot action. Strong levels of players influence the ability to throw faster (3), however, in the present study, while the shot velocity differs between subgroups, no differences of maximal hand grip were found. This inequality of shot velocity leads us to other explanatory factors, as coordination in the throwing movement (3), technical aspects and the players body size. Ascertaining this last, in present study, Spaniards were the highest, heaviest and had longer arm span ($p \leq 0.01$), confirming it.

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Poster

AQUATIC PLYOMETRIC TRAINING

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INTRODUCTION

Plyometric training is a very popular form of physical conditioning of healthy individuals that has been extensively studied over the last 3 decades (1, 2, 3). Despite the widespread acceptance, several researchers (4) have questioned the efficacy and highlighted the potential risks of plyometric training programs as a conditioning technique. Aquatic plyometric training (APT) might be an alternative method to develop the conditioning and safer than land-based plyometric training (PT). Therefore, the purpose of this study was to compare the effects of APT versus PT on vertical jump.

METHODS

Thirty-six students of Physical Education (age: 21.0 ± 2.6 years; height: 1.77 ± 0.04 m; weight: 74.9 ± 8.2 kg; % fat: 19.7 ± 5.0) took part in this study. They were randomly assigned in one of three groups: aquatic plyometric group (APT, n = 12), land-based plyometric group (PT, n = 12) and control group (CG, n = 12). The training program was performed for 6 weeks with a frequency of 2 sessions per week. Volume was increased from 10 sets of 10 repetitions to 10 sets of 35 repetitions. The performance was evaluated by the squat jump (SJ) and the countermovement jump (CMJ) by Bosco's platform.

RESULTS

After plyometric training, APT and PT obtained significant increases in SJ ($p \leq 0.01$) and CMJ ($p \leq 0.05$), whereas CG remained unaltered. Any significant difference was found between groups, however APT and PT reached almost significantly ($p = 0.07$) greater improvements than CG in CMJ. Furthermore, in SJ only APT showed almost significantly ($p = 0.06$) higher increases than CG.

DISCUSSION

APT and PT produced similar improvements on height jump (SJ and CMJ) after 6-wk plyometric training. Both groups were effective to increase the jump performance, but the lower stress produced the buoyancy of water in APT might reduce the potential risks of plyometric training programs (4, 5, 6). In conclusion, APT may be an alternative method to PT, because both training protocols produce similar gains on vertical jump but APT might cause lower mechanical stress.

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ISOKINETIC KNEE FLEXOR-EXTENSOR MUSCLES STRENGTH IN YOUNG AND PHYSICALLY ACTIVE WOMEN

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INTRODUCTION

Isokinetic dynamometry results could be expressed as the relationship flexors/quadriceps (1). Young and non-professional athletes' women having not suffered any injury are the less studied population using this technique. Our objective is to determine the relationship flexors/quadriceps in a female adolescents group owing to the laterality and velocity of movement.

METHODS

The sample was composed by 26 young women, between 16 and 17 years old, physically active but non-professional athletes. They haven't suffered any knee injuries or muscular pain. Isokinetic dynamometer KIN-COM was used to obtain quadriceps (Q) and hamstring (H) maximal concentric (c) and eccentric (e) forces, on right and left sides of the body, in two different velocities (60 y 180º/s) and in a range of movement between 80º and 10º (0º = complete extension). Maximal peak torque of the curve force/angular position was obtained in each exercise. These values were used to calculate concentric (Hc/Qc) and functional (He/Qc) ratio. Differences between variables were obtained with variance analysis (ANOVA). The paired-sample t-test was used to analyze intra-individual differences.

RESULTS

At a 60º/s speed, the baseline ratio Hc/Qc for the dominant side was 0,71±0,1; and for the non-dominant side, 0,70±0,08. The mean ratio He/Qc was 0,88±0,12 and 0,86±0,18 for the dominant and non-dominant side respectively. At a 180º/s speed, mean Hc/Qc for the dominant and non-dominant side were 0,99±0,22 and 0,96±0,16. And for the ratio He/Qc, were 1,33±0,29 for the dominant and 1,33±0,26 for the non-dominant side. There were no significant differences between both body sides for any ratio. Comparing values at 60º/s and 180º/s speed, there were significant differences ($p<0,001$) either in dominant and non-dominant sides and ratios, being higher the ratios developed at higher velocities. Respecting ratios, there were statistically ($p<0,001$) higher scores in the functional one (He/Qc).

DISCUSSION

Dominance does not affect ratio values, therefore in the case of unilateral pain; the sane side could be used to obtain reference scores. A higher speed makes flexors strength predominates against quadriceps force, increasing ratio values (rising values higher than 1).

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Poster

QUADRICEPS AND HAMSTRING MAXIMAL ECCENTRIC /CONCENTRIC STRENGTH IN FEMALE VOLLEYBALL PLAYERS

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INTRODUCTION

Physical training and sports practice can enhance muscular strength and generate neuromuscular adaptations. These muscular changes have previously been measured with isokinetic dynamometry (1). Other studies have compared knee flexor-extensor muscles strength in volleyball players and other athletes (2). Research has mainly been developed in men, using peak torque strength and hamstring/quadriceps ratio (H/Q) (3). In this study we analyze if sport practice involves changes in the relationship between eccentric and concentric strength.

METHODS

Quadriceps and hamstring maximal concentric and eccentric force has been measured in a female volleyball player national elite group (n=19) and in a female student non-volleyball player group (n=21). Isokinetic dynamometer KIN-COM was used to obtain force/angular position curves at two different velocities (60 and 80º/s) in right and left leg. Maximal peak torque for each muscle and velocity was obtained. The relative difference between concentric (PTE) and eccentric (PTC) forces was calculated with this formula: Difference= (PTE-PTC)/PTC*100. Differences between variables were analyzed with the independent- sample t-test.

RESULTS

Absolute peak torque values were significantly different ($p<0,0001$) between both groups. Volleyball players developed a higher force in dominant and non-dominant leg, in each muscle and type of muscular contraction measured in the two velocities. There were no statistical differences between players and non-players with respect to the percentage of variation. In both groups this percentage is close to 25% for hamstring at 60º/s, and to 38% at 180º/s. Quadriceps percentage is around 50% for the low velocity, and overcome the 100% for the fast velocity. These scores were slightly higher in volleyball players.

DISCUSSION

Elite female volleyball players develop a higher force in quadriceps and hamstring than other non-practitioner female. According to Almosnino et al (2010), in all cases a higher strength is developed in eccentric muscular contraction. Relative differences between eccentric and concentric forces don't change practicing sport, but are different depending on the execution velocity. Higher differences between groups were in quadriceps at high speed.

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Poster

STRENGTH TRAINING AND RUNNING ECONOMY: IS THERE BENEFIT?

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KEY WORDS

Running economy; strength; elastic energy; energy cost.

INTRODUCTION

Running economy (RE) is one of the determining factors in aerobic performance in distance runners together with the maximal oxygen uptake (VO_{2max}), the fractional use of VO_{2max} and the VO_2 kinetics (3). The current literature, in elite runners, supports that while VO_{2max} remains almost the same over the years, both the $\%VO_{2max}$ and the vVO_{2max} a runner can maintain increase.

METHODS

We analysed the literature to determine the most effective methods to increase RE and when is the appropriate time to use such methods to maximize the effects of the aerobic performance (concurrent training).

RESULTS

One effective method to improve RE is the correct strength training in all its aspects –maximal strength (1, 2, 4, 5), explosive and plyometric strength (4, 6, 8) and CORE stability and strength (7)–. Against, traditionally the "endurance strength" has been trained to increase aerobic performance, but actually has been rejected because it does not produce improvements (2). Finally, in relation to the moment of making strength session, there are evidences that it should be realized just after the endurance session to maximize benefits.

DISCUSSION

There are multiple benefits runners can achieved with a suitable strength training on RE, so we should leave behind old beliefs and use training methods that have been validated by scientific researches. Furthermore, we can support that strength and endurance should be trained in the same sessions to maximize the mitochondrial biogenesis.

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Poster

TRAINING-LOAD AND MUSCULAR POWER DIFFERENCES BETWEEN THE SEASON BEST AND WORST COMPETITION IN HIGH-LEVEL RUNNERS

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INTRODUCTION

Reducing the training load seems to be a good strategy to increase physical performance in endurance events (1, 2). However, the analyses of the training load before the best and worst competition performances throughout a whole season, as well as the changes on neuromuscular performance, are unknown on high-level middle and long-distance runners.

METHODS

Fifteen high-level middle and long-distance runners from the High Performance Sports Center of Madrid (12 men, 3 women; age = 26.3 ± 5.1yrs.), with personal bests in outdoors 1500-metres between 3:38 - 3:58 min (men) and 4:12 – 4:23 min (women) took part in this study. Competition performance was recorded throughout a whole training season while countermovement jump (CMJ) were measured weekly. Also, session-RPE and km run for each training session were recorded during the season. Mean values of these variables right before the best (SB) and worst (SW) competition performance of the season were compared. For the comparison of means, we used the paired samples t-test. For the calculation of the effect size, we used Hedge's g. The level of significance was set at 0.05. All calculations were performed using IBM® SPSS® Statistics 22 (IBM Co., USA).

RESULTS

Significant differences, with medium to high effect sizes, were observed on the CMJ ($g=0.65$, $p<0.001$) and on the mean session-RPE ($g=0.94$, $p<0.05$) values measured the week before the SB and SW competition performance. Specifically, the CMJ measured before the SB was 8.5% higher than before the SW, while the mean session-RPE measured the week prior to the SB was -17.6% lower than before the SW. Also, the amount of km was lower (-15%, $g=0.48$, $p=0.14$) with a moderate effect size, the week before the SB in comparison with SW, although not in a significant way.

CONCLUSIONS

Prior to the best competition of the season, athletes had higher performances on the CMJ,and they trained less km and with lower perceived exertion. The lower training load and the greater neuromuscular performance may help increasing competition performance in high-level distance runners.

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Poster

INFLUENCE OF COMPLEX TRAINING ON AGILITY OF FOOTBALL PLAYERS

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INTRODUCTION

The main factors that determine the success in football players are resistance and the capacity to repeat sprints (Chamari et al., 2005; Chaouachi et al., 2010); flexibility, agility, and optimal level of strength (Wisloff, Castagna, Helgerud, Jones, & Hoff, 2004). The important actions that come about during the match (dodge, shots, sprints...) are mainly associated with those movements of quick production of strength (Hoff & Helgerud, 2004). In order to improve and increase power on team sports different and not many scientific methods have been used, and the majority of them got strength increase without specific actions (Chirosa, Chirosa, Requena, Feriche, & Padial, 2002). The combination of workout with external weight exercises that are followed by strength and plyometryc training without weight will give goods results about the transformation of strength in power (Ebben, 2002; Kanniyan & Syed, 2013). There are studies which have highlighted the increase on resistance (Faigenbaum, O'Connell, La Rosa y Westcott, 1999), jump (Santos & Janeira, 2008) and agility (Zepeda y González, 2000). The purpose of this study is, in one hand,prove the effects of the strength and plyometryc training and, on the other hand, the effects of the conventional strength training over the agility in young football players.

METHODS

This study is composed of seventeen male football players who compete in regional categories. All are sixteen or seventeen years old. For this study we used eight football players within the experimental group (EG) and nine football players in the control group (CG). All of them train three times a week and play one match each weekend. On each session we programmed three series with ten repetitions and two minutes to rest between each series with a weight of 60-75% 1RM. After the resistance training, EG do plyometryc workout. We evaluated the agility before and after the program through Illinois test.

RESULTS

Just the EG has improved significantly ($p \leq 0,05$) the time in the Illinois test. There is not a significant progress when comparing both training groups.

DISCUSSION

The EG which the "complex training" has improved the agility. This can be due to the combination of strength training with plyometryc training which is the most effective way to increase the performance in power exercises. Other studies that have applied a similar training have found increased in jump (Santos & Janeira, 2008) and agility (Zepeda y González, 2000). Nevertheless, there aren´t any differences in the training adaptation when a conventional training and "complex training" are compared.

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Poster

MAXIMAL POWER DURING BENCH PRESSES AND PRONE BENCH PULLS WITH DIFFERENT WEIGHTS IN ROWERS

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INTRODUCTION

It has been shown that activation of stretch-shortening cycle during countermovement (CM) weight exercise (e.g., bench press) enhances power production in concentric phase compared to lift from the rest. Such CM enhancement of power depends on weight lifted (1) with some optimal load at which maximal potentiation of power occurs. However, in some sports the movement is performed with small CM or even without CM (e.g., punch, shot put) and as such is also trained. In other sports, both push and pull exercises are included in weight training workout (e.g., rowing). For these athletes, maximal strength and power tests involving leg pressing and arm pulling have been found (2) as reliable (ICC 0.82-0.99) and sensitive to differentiate between stronger rowers and their less competitive peers. Since little is known on power production during weight exercises performed without CM, this study compares maximal power during concentric-only bench presses and prone bench pulls with different weights in rowers.

METHODS

A group of 12 rowers (age 26.2±3.4 years, height 185.8±9.1 cm, weight 81.0±12.8 kg) performed in random order 3 repetitions of barbell bench presses without CM and prone bench pulls. Initial weight of 30 kg was increased by 10 or 5 kg (at higher loads) up to 1RM. The FiTRO Dyne Premium system based on precise analogue velocity sensor with sampling rate of 100 Hz was used to monitor basic biomechanical parameters involved in exercise. Force is calculated as a product of mass moved and the sum of an instant acceleration and gravitational constant. The acceleration is obtained by derivation of velocity, registered by rotating analogue sensor coupled with the barbell by means of nylon tether. Power is calculated as a product of force and velocity.

RESULTS

Peak power was significantly higher during prone bench pulls than during bench presses with weights of 30 kg (670.6±56.0 vs. 526.2±42.8 W, $p<.05$), 40 kg (921.9±59.2 vs. 571.7±49.7 W, $p<.01$), 50 kg (1086.3±73.1 vs. 641.1±54.8 W, $p<.001$), 60 kg (1137.2±81.5 vs. 610.3±51.8 W, $p<.001$), and 70 kg (1044.7±72.7 vs. 559.1±45.9 W, $p<.001$).

DISCUSSION

Peak power was significantly higher during prone bench pulls than during concentric-only bench presses at all weights lifted (from 30 to 70 kg) with maximal values achieved at higher weights (60 and 50 kg, respectively).

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THE ELASTICITY INDEX IN VERTICAL JUMP AND POWER PUSH-UP EXERCISE IN YOUNG GYMNASTS

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INTRODUCTION

Plyometric exercises are commonly used in gymnastics training for development of explosive power. To evaluate the efficiency of such training, the elasticity index is usually calculated using vertical jump tests. However, less attention is paid to upper limbs. For this purpose, plyometric exercises such as power push-ups, can be used. So far, a little is known to which extent the ability to utilize elastic energy differs in these two tests, and whether this difference depends on age. Therefore, the aim of the study was to compare the elasticity index in vertical jump and power push-up exercise in gymnasts of different ages.

METHODS

Two groups of ten male gymnasts of 12 to 14 years old doing the sport on average 6 years (height 148.2 ± 9.4 cm, weight 39.7 ± 13.8 kg) and 15 to 18 years old doing the sport about 10 to 12 years (height 169.2 ± 12.5 cm, weight 62.5 ± 13.9 kg) performed in random order vertical jumps and power push-ups, both without and with countermovement. Subjects were instructed to perform the exercises with maximal effort in concentric phase. Flight time (Tf) was measured by the contact mattress with an accuracy of 1 ms using the computer based system FiTRO Jumper (FiTRONiC s.r.o., SK). Height of the vertical jumps and the push-ups was calculated by inclusion of flight time as the numerator in the quotient, as follows: $(g \cdot Tf^2) / 8$, where g is 9.81 $m.s^{-2}$. The elasticity index was calculated, as follows: ({CMJ - SJ}/CMJ)x100 (1).

RESULTS

The elasticity index was significantly higher in vertical jumps than in power push-ups (9.8 and 4.6, respectively; $p = 0.013$) in 12-14 years old gymnasts. On the other hand, its values did not differ significantly between jumps and push-ups (15.7 and 12.9, respectively; $p = 0.332$) in 15-18 years old gymnasts. In both groups, a moderate correlation ($r = 0.42$) between the elasticity index calculated from vertical jumps and power push-ups has been found. Additionally, the elasticity index calculated from power push-ups showed significantly greater between-subject variability as compared to vertical jumps ($p = 0.035$).

DISCUSSION

The elasticity index was significantly higher in vertical jumps than in power push-ups, however, only in younger gymnasts of age 12-14 years. Older gymnasts of age 15-18 years were able to perform similarly during both exercises. Such parameter calculated for upper body may provide additional information on the capability to utilize elastic energy during countermovement exercises and may complement existing testing methods.

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Poster

NEUROMUSCULAR PERFORMANCE IS AFFECTED BY SET CONFIGURATION AND THE TYPE OF RESISTANCE EXERCISE

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INTRODUCTION

Adaptations in resistance training are influenced by the interaction between mechanical, hormonal and metabolic stimuli, which can be modulated by many variables. The relationship between the number of repetitions performed in each set and the maximum possible number of repetitions (set configuration) is an important factor that determines the adaptations obtained with resistance training. Different set configurations may have dissimilar neuromuscular performance eliciting different adaptations. The aim of this study was to compare the effect of set configuration on neuromuscular performance in two different exercises.

METHODS

Ten undergraduate students (23.7±1.7 yr; 1.72±0.07 m; 68.16±8.87 kg) with experience in resistance training were assessed in 3 set configurations and 2 resistance exercises. 10 repetitions maximum (RM) was obtained twice for bench press and parallel squat. In a semi-counterbalanced design, subjects performed 5 maximal sets with the 10RM load with 3 minutes between sets (Failure Session, FS). With the repetitions performed in FS and their total rest (720 s), subjects performed a session with rests between each repetition (1S) and a session with rests distributed between clusters of 5 repetitions (5S), As intensity, total work and rest was similar among session, same work-to-rest ratio was guaranteed. Maximal Propulsive Velocity (MPV), mean Propulsive Velocity (mPV), and the ratio of MPV/mPV as an indicator or neuromuscular fatigue (loss of velocity, LV) were obtained. A two-way ANOVA with repeated measures (Session x Exercise) with a predetermined alpha level of 0.05 was used.

RESULTS

There was a main effect for Session for mPV and LV, with lower in mPV and a higher LV for FS in comparison with 1S and 5S (mPV: 0.30±0.05 vs. 0.36±0.05 vs. 0.36±0.07 m.s-1; LV: -33.36±10.12% vs. -18.12±6.86% vs. -19.29±6.43%). A main effect between exercises for MVP and LV were observed, with higher values for bench press compared with parallel squat (MVP: 0.46±0.08 vs. 0.42±0.05 m.s-1.; LV: -27.14±12.48% vs. -20.05±6.55%). An interaction between Session x Exercise for mPV and LV revealed that differences between exercises only were observed for FS, with a higher neuromuscular fatigue in bench press.

DISCUSSION

Both 1S and 5S allowed a higher neuromuscular performance with a lower loss of velocity in comparison with FS, suggesting that these set configurations involved greater mechanical stimuli. Differences between exercises indicate that the degree of velocity loss depends of the exercise performed, as reported by Sánchez-Medina & Gónzalez-Badillo (2011), probably due to their initial maximal velocity and the lower velocity reached in small muscles, especially when exercise to failure is performed.

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DOES THE INCLUSION OF LOW INTENSITY EXERCISES IN COMPLEX TRAINING AFFECTSJUMP AND SPRINT PERFORMANCE?

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INTRODUCTION

The Complex Training (CT) is based on the assumption that an explosive skill can be improved when it is preceded by a strength training exercise (STE) performed with a load between 100%-80% of 1RM. This method is supported by the existence of a post activation potentiation (PAP) of the neuromuscular system (1, 2). However itis necessary to followan individual recoverytime between the STE and the explosive skill to observe an increase of the performance. However,a specific recovery time is difficult to implement in team sports. Based on this evidence, the aim of the present study was observe if the inclusion of low intensity technical exercises between pairs of CT exercises, increases the performanceatthe counter movement jump (CMJ) and 15 m sprint (S15) performedby young soccer players.

METHODS

Before the beginning of the study the subjects and their parents were notified and informed about all procedures, possible risks and discomforts associated with testing, and signed an informed consent according to the Helsinki Declaration (2008). All subjects completed medical and physical activity questioners to verify the absence of disease or limitation. Nineteen young male soccer players, (age = 17.47±0.51 years; body mass =70.10±7.15 kg; height= 178.00±6.17 cm; and stage 4 at the Tanner scale) were submitted randomly tothreetests conditions for CMJ andfor S15, amounting six sessions, separated by 72 hours: i) Squat exercise (SQ),four minutesof passive restand the CMJ or the S15; ii) SQ,four minutesof low-intensityshort passesand the CMJ or the S15; and iii) SQ,fivemetersof low-intensity skipping and the CMJ or the S15.Repeated-measures *ANOVA* and a Bonferroni post-hoc test were conducted for after the appropriate mathematical assumptions were verified. Significance level was maintained at 5%. The Institutional Research Ethics Committee approved the study.

RESULTS

No significant differences were observed between the three different testing conditions neither on the CMJ nor in the S15.

DISCUSSION

These results show that the three forms of CT exercise proved similar efficacy as to the PPA involved in the CMJ and in the S15. So, it is concluded that low-intensity technical exercises may be used during CT sessions in team sports, as a means to train simultaneously theexplosive strengthand technical skills.

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Poster

EFFECT OF A REPEATED POWER TRAINING ON REPEATED-SPRINT AND JUMPING PERFORMANCE IN BASKETBALL PLAYERS

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INTRODUCTION

The ability to repeat high intensity actions such as sprints and jumps for the entire duration of a match has been identified as an important physical fitness component in basketball (1). Therefore, the main aim of this study was to examine the effects of adding a repeated power ability training to normal training sessions on repeated sprint performance and jumping ability in young basketball players.

METHODS

Twenty-two highly trained male young basketball players were randomly assigned either to a repeated power training (RPT) (n=11) or a control (CON) (n=11) group. RPT added twice a week during 6 weeks a training program consisting of 1-2 blocks of 5 sets x 5 repetitions with the load that maximized power output of leg press exercise. Before and after training, physical performance was assessed by best (RSA_b), slowest (RSA_s) and mean (RSA_m) sprint time on a repeated sprint ability test, and best ($RCOD_b$), slowest ($RCOD_s$) and mean ($RCOD_m$) sprint time on a repeated change of direction ability test. Horizontal unilateral hop with right (U_R) and left leg (U_L) and a drop jump followed by a double hop with right and left leg tests were also assessed.

RESULTS

After training, RSA_s, RSA_m, $RCOD_b$, $RCOD_s$, and U_R and U_L were substantially improved in the RPT group. Conversely, no substantial changes were observed in the CON group in any test. Between-group differences showed substantially better scores on RSA_s, RSA_m, $RCOD_b$, $RCOD_s$, and U_R and U_L in RPT in comparison to CON. Relative improvements in RSA_m and RSA_s were largely correlated (r=0.68, [90% confident limits: 0.44; 0.85]). The relative improvement of $RCOD_b$ and $RCOD_m$ was very largely correlated (r=0.89 [0.76; 0.94]).

DISCUSSION

Due to the large relationship between the relative improvement of RSA_m and RSA_s, and no substantial enhancements in RSA_b, it may be suggested that RPT have improved RSA performance through mechanisms no related with the initial sprint performance, such as a better recovery between sprints (i.e., metabolic factors). Conversely, the improvement in $RCOD_m$ was directly mediated by a reduction in $RCOD_b$ (i.e., neuromuscular factors). In conclusion, the improvements in repeated sprint exercise performance together with the enhanced jumping performance suggest that RPT might concurrently stress both metabolic and neuromuscular factors that might impact more functional physical performances.

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CHANGE OF DIRECTION DETERMINANTS IN YOUNG BASKETBALL PLAYERS: DO ANGLES MATTER?

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INTRODUCTION

It has been suggested that the main determinants of change of direction ability (CODA) are technique, straight sprinting speed, anthropometry and leg muscle qualities (1). However, it seems that differences exist in the biomechanics and neuromuscular determinants of straight-line sprints and sprints with different change of direction (COD) angles (2). Therefore, the aims of the present study were to analyze the main determinants of sprints with different COD angles and to examine their relationships.

METHODS

Twenty-four highly trained male young basketball players (U-16 to U-20) participated in the present study. Players performed a countermovement jump (CMJ) test, an unilateral CMJ test with right (CMJ_R) and left (CMJ_L) leg, an unilateral horizontal jump test with right (HJ_R) and left (HJ_L) leg, a 5-m, 10-m, 20-m and 25-m linear sprint, a 5+5 m sprint with one COD of 45° (COD45), 90° (COD90), 135° (COD135) and 180° (COD180) to either right and left, and a incremental back squat load test. The mean of the right and left sprint in each COD angle was used to posterior analysis. The one-repetition maximum (1RM), maximum power output (MP), 1RM normalize to body mass ($1RM_{BM}$) and MP normalize to body mass (MP_{BM}) were the variables extracted from the incremental test.

RESULTS

The main determinant of COD45 (r=0.80, [90% confident limits: 0.61; 0.90]) and COD90 (r=0.62 [0.32; 0.80]) was linear sprint (20-m and 10-m, respectively). Conversely, CMJ was the main predictor of COD135 (r=-0.63 [-0.80; -0.36]) and COD180 (r=-0.71 [-0.85; -0.49]). The only COD sprint that was largely correlated with others COD sprint was COD135 (COD90 [r=0.71] and COD180 [r=0.74]). Interestingly, neither 1RM nor MP were highly correlated with any COD test, though the higher angle, the better correlation with $1RM_{BM}$ (r= 0.1 to -0.25) and MP_{BM} (r= 0.05 to -0.31).

DISCUSSION

The present results show that there were different determinants for each COD test. It seems that lesser angles are mainly related to linear sprint while higher angles appears to depend more on explosive strength (i.e., CMJ). Thus, it can be speculated that training methods should consider the most common angles performed during games to address their specific COD determinants.

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Poster

ARE THERE DIFFERENT PERFORMANCE ADAPTATIONS AFTER UNILATERAL OR BILATERAL STRENGTH TRAINING?

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INTRODUCTION

The ability to perform high intensity actions is an important prerequisite for successful participation in basketball and other team sports (1). In this regard, determinant actions such as sprints, changes of direction (COD) or jumps are usually performed unilaterally. Therefore, the aim of the present study was to examine the effects of unilateral and bilateral strength training in physical fitness performance.

METHODS

Eighteen young highly trained male basketball players participated in the study. Players were randomly assigned into 2 training groups who performed either unilateral (UNI) (n=9) or bilateral (BIL) (n=9) strength training twice a week during 6 weeks. Tests included a countermovement jump (CMJ) test, 5-m, 15-m and 25-m linear sprints, a 25-m sprint with 4 COD of 45° (V-cut test), a 15-m sprint (7.5 m + 7.5 m) with one 180° COD performed both right (COD180R) and left (COD180L) leg and an incremental bilateral and unilateral squat load test. Both training groups performed 3 sets of back squat. In each set, players were asked to perform the maximum number of repetitions until power output (measured via a linear encoder) felt below 90% of maximum power output (MP). Players also performed 2 sets of 5 drop jumps (UNI=0.2 m; BIL=0.4 m) and 2 sets of 5 countermovement jumps with arm swing.

RESULTS

CMJ, 5-m, 15-m, 25-m, COD180R, MP with both legs (MPB), MP with right leg (MPR) and MP with left leg (MPL) were improved substantially *(almost certainly to likely)* in both groups. Furthermore, the unilateral training group substantially improved COD180L (*likely*) and unilateral strength deficit between legs (U_{DEF}) (*very likely*) whereas remained unchanged in the bilateral training group. Between-group differences showed *likely* better performance in COD180L, MPR, MPL and U_{DEF} for UNI compared with BIL group.

DISCUSSION

The present results show that both training regimes induced similar physical fitness performance adaptations. Nevertheless, UNI training was more efficient than BIL at improving most of the single leg function tests (e.g., COD180L, MPR, MPL and U_{DEF}).

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PHYSICAL FITNESS DIFFERENCES BETWEEN DIFFERENT COMPETITIVE STANDARDS IN SPANISH SOCCER PLAYERS

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INTRODUCTION

Soccer is a multifaceted sport, in which success depends on a complex interaction between several tactical, technical and physical factors (1).

The major physical fitness factors that appear to stress competitive standard and gender differences are agility and specific endurance (2). Nevertheless, little is known on the possible differences in fitness level between players of different competitive standards and gender. Thus, the purpose of this study was to compare the fitness characteristics of players of different competitive level and gender.

METHODS

One hundred twenty one soccer players participated in the present study. Players were divided in their corresponding competitive level: professional (PRO, n=27), semiprofessional high level (SHL, n=18), semiprofessional low level (SLL, n=18), amateurs (AMA, n=22), junior national level (U-19, n=19) and female superleague players (FSL, n=17). Participants were assessed three times during the competitive season via a testing battery that included: a countermovement jump test (CMJ), a 15-m and 40-m linear sprint test, a 25-m sprint with 4 x 45° change of direction test (COD) test (V-cut test), and a supramaximal intermittent fitness test (30-15). The best result of each test was used to posterior analysis.

RESULTS

Substantial better performance (all effect sizes (ES) < 0.2) in COD and CMJ was shown as competitive level increased in soccer players with the exception of U-19 and SLL, and PRO and SHL in CMJ. No substantial differences were found between PRO, SHL and SLL in 15-m, 40-m and 30-15 (all ESs <0.2). Furthermore, there were no substantial differences between these teams (i.e., PRO, SHL and SLL) and U-19 in 15-m.

DISCUSSION

The present results show that COD performance appears to be the main physical fitness factor differentiating playing competitive standards in soccer. These results are in accordance with those previously reported in male and female soccer players (2). Interestingly, the explosive power, sprinting speed and supramaximal intermittent endurance might only differ between competitive levels until players achieved an adequate level (e.g., semiprofessional). In summary, COD seems to be the major factor that stresses gender, age and competitive level differences in soccer players.

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Poster

DETERMINANTS OF A GENERAL AND SPECIFIC REPEATED-SPRINT TESTS IN YOUNG BASKETBALL PLAYERS

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INTRODUCTION

Repeated sprint ability (RSA) is considered as one of the most important fitness prerequisites in basketball players (1). In recent years, several team-sports specific repeated-sprint tests have been proposed.

However, whether these team-sports specific repeated sprint ability tests can really bring relevant information to the team and individual players can still be questioned (2).

Thus, the aim of the present study was to analyze the main determinants of specific (RSS) and general (RSG) repeated sprint tests and their inter-relationships in young basketball players.

METHODS

Thirty-five young highly-trained male basketball players participated in the study.

Players were divided into three age groups (U-14 [n=15], U-15 [n=11] and U-16 [n=9]). Tests included anthropometric measurements, a 5-m, 10-m and 25-m linear sprint test, a 20-m shuttle run test (20-m ST), a RSS and a RSG. RSS consisted in 6 x 5 m + 5 m sprints with a 45° change of direction (COD) whereas RSG 6 x 25-m linear sprint. In both tests, players had 20 s of passive recovery between each sprint.

Best (RSS_b and RSG_b) and mean (RSS_m and RSG_m) sprint time, and the percentage of decrement ($\%Dec_{RSS}$ and $\%Dec_{RSG}$) during RSA tests were analyzed.

RESULTS

RSS_m was explained (model r=0.91) through 25-m sprint time (r=0.89 [90% confident limits (CL): 0.81; 0.94]) and the final speed reached at 20-m ST (r=-0.78 [-0.87; -0.63]). RSG_m predictors (model r=0.97) were 25-m sprint time (r=0.94 [0.90; 0.97]), the final speed reached at 20-m ST (r=-0.77 [-0.86; -0.62]), and the percentage of body fat (%BF) (r=0.75 [0.60; 0.86]). Almost perfect correlations (range: 0.94 to 0.99) were found between every RSA variable analyzed (i.e., RSS_m and RSS_b, RSG_b, and RSG_m). Between-group differences showed substantially better performance in the older groups (U-14<U-15<U-16) in each RSA variable with the exception of $\%Dec_{RSS}$ and $\%Dec_{RSG}$ that was likely better in the U-14 group.

DISCUSSION

Both RSA tests (i.e., general and specific) appear to be determined by similar qualities. In basketball players, repeated sprint performance could be predicted by linear sprinting speed (as the main determinant) and 20-m ST.

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AGE-RELATED DIFFERENCES IN A V-CUT CHANGE OF DIRECTION TEST IN YOUNG BASKETBALL PLAYERS

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INTRODUCTION

Change of direction ability (CODA) is considered an important physical fitness prerequisite for successful participation in many team-sports (1, 2).

Several studies have assessed the reliability and validity of different CODA tests in team-sports players (1, 2). In this regard, several CODA tests have been shown to be highly reliable in team-sports athletes (2). Conversely, no consistency is found in the age-related differences in young team-sports players (1, 2). It can be speculated that the absence of age differences might be due to the fact that those tests are general in nature and do not reflect the on-field movement demands typically observed in team-sports (3). Thus, the aim of the present study was to examine if a more specific CODA test is representative of age in young basketball players.

METHODS

Fifty-three young highly trained basketball players participated in the present study. Players were divided into five age groups: U-14 (n=12), U-15 (n=13), U-16 (n=11), U-18 (n=10) and U-20 (n=7). These players performed a 25-m sprint with one change of direction (COD) of 45° each 5 m (i.e., 4 in total) (V-cut test). The V-cut test was executed several times during the entire season (i.e., at least 3 times) and the best time was used to examine the age-related differences.

RESULTS

Substantial better performance in V-cut test was shown as age increased in young basketball players (U-20>U-18>U-16>U-15>U-14).

DISCUSSION

The present results show that meaningful differences in V-cut between each consecutive age group. These results are not in agreement with previous studies (1, 2), which have found small and no significant differences in CODA performance between U-16 and U-18 (1) and U-14 and U-15 (2) rugby players. It is possible that specific team-sports patterns (V-cut COD) may have been responsible for these between age-group differences observed in the present study. Therefore, the V-cut test appears to better simulate team-sports COD movements, making it a more suitable test when a more specific assessment of team-sports CODA, such as talent identification, is required.

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Poster

EFFECTS OF FLYWHEEL RESISTANCE TRAINING FOR GAIT IMPROVEMENT IN FEMALE ALZHEIMER'S PATIENTS

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INTRODUCTION

Onambele et al (1) found that quadriceps flywheel loading not only produces a greater increase in power than weight training but its physiological benefits also transfer/ overspill to the plantarflexor muscle–tendon unit resulting in a significantly improved balance.

Noorbrand et al (2) believe the higher eccentricelectromyographicactivity noted with flywheel resistance training (FW) exercise compared to standard weight lifting could be attributed to its unique iso-inertial loading features. Brzenczek-Owczarzak et al (3) say FW is efficacious and can be used in older womento improve strength and power using smaller external loads.

METHODS

A total of 12female Alzheimer's patients (age: 77.83±3.24; body weight: 61.00±12.03; height: 153.92±5.73) were assessedusing TMG in ankle musculature [Anterior Tibialis(TA), Medial Gastrocnemius (GM) and Lateral Gastrocnemius(GL)],Maximal radial deformation (Dm), delay time (Td), and contraction time (Tc) were obtained for each musclebefore starting the intervention program (pre-assessment) and after completing 24 sessions divided into two sessions per week and 3 sets of two minutes of flywheel inertial training with Yo-Yo system leg press (post-assessment).In order to evaluate the effects on gait were used implemented templates paroTec ®-system of 24 pressure sensors with data processing software paroContour ®-modelingbefore and after the training program.

RESULTS

Significant changes were observed in the gait supports. The changes relate to: reduction of the support phase (SP), increased duration of push offphase (PP). No changes were observed in the initial (IP) and overlap (OP) phases of the transition from one foot to another.These changes are enhanced by the neuromuscular adaptations of the ankle musculature: GM and GL presented significant statistical difference($p \leq 0.05$)in Tc and Td for right limb, and Tc for GM left limb too. TA has shown lower valuesat all parametersand significant statistical difference($p \leq 0.05$) in Dm for both limb and Td right.

DISCUSSION

Female Alzheimer's patients improved gait quality after flywheel resistance training through better use of push off phase and a reduction of the support phasedue to a conditional improvement plantar flexor and ankle extensors (GM and GL). These results match expected hypothesis after studying previous research (1, 2, 3).

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THE EFFECT OF STRENGTHENING PRE-SURGERY PROGRAM IN ELDERLY PATIENTS UNDERGOING A TOTAL KNEEARTHROPLASTY

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INTRODUCTION

Patients with OsteoArthritis (OA) who are on waiting lists for a Total Knee Arthroplasty (TKA), usually aggravate their symptoms and their functional level while they are waiting for the operation, so the conditions of the same patients from the baseline to the surgery get worse. During this period, it's unusual to follow a Prehabilitation Program (PP), which guarantees a better functional state preceding surgery. PP in patients undergoing a TKA is an alternative method to mitigate these complications (1), but there isn´t currently recognized a preoperative protocol (2). The purpose of our study is to determine the effectiveness of aPP in patients with primary knee OA following a TKA, based on a strengthening program.

METHODS

We recruited 61Patients(64.1 ± 4.5 years, 1.65 ± 0.08 m, 75.2 ± 9.0 kg), for primary OA, who were scheduledfor TKA. Patients were randomized into an Intervention Group (IG), (n=31) and aControl Group (CG), (n=30). Participants completed a series of baseline Questionnairesand functional testing.

The CG maintained normal daily activities and the IGperformed a PP at least 3 times per week for 8 weeks before surgery, this program was focused onquadriceps, hamstrings, and gastrocnemius strengthening, performing 10sets of 10 repetitions (75% 1RM). 3 test sessions of familiarization took place prior to the 1RM tests.

RESULTS

The intraclasscorrelation for 1RM test-retest measures was 0.988 (95% confidence interval = 0.989-0.987). Comparing both groups, IG showed meaningful changes in each studied item, CG had a similar status compared with baseline, some of them got worse in terms of functionality and pain.

DISCUSION

The intensity of the PP may affect clinical outcomes, although as stated these have not been well studied in people with OA. Studies which include a prehabilitationstrengthening program don't quantify the required loads to obtain meaningful improvements (3). They plan the sets and the repetitions without a maximum reference value (4). In our study the 1RM test has showneffectiveness in untrained elderly people with OA to determine the load of the PP.

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Poster

RELATIONSHIP BETWEEN HANDGRIP STRENGTH AND BONE HEALTH IN INSTITUTIONALIZED ELDERLY POPULATION

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INTRODUCTION

Aging is characterized by a progressive loss of functional capacity and changes in body composition. It has been shown that lean mass decreases from 25 to 30% between 30-80 years old (1,2). In addition, handgrip strength has been also related with health, and at some points with bone or lean masses.

Whether a non-invasive test such as handgrip dynamometry might be useful to determine low bone mass in institutionalized elderly will help to avoid unnecessary X-ray assessment or to earlier detect possible cases of osteoporosis. Therefore, the aim of this study was to determine the relationship between handgrip strength and bone strength parameters measured with quantitative ultrasound technique (QUS).

METHODS

Sixty-five residents older than 69 years institutionalized in the CAI-Ozanam residence (Zaragoza, Spain) participated in the study. Handgrip strength (kg) of both arms was measured using a digital dynamometer (TKK 5101 Grip-D; Takey, Tokyo, Japan). QUS values (speed of sound [SOS] and broadband ultrasound attenuation [BUA]) of the non-dominant heel were measured at the calcaneus with an Achilles Insigthdevice (Lunar Achilles InSight). Stiffness Index (SI) was also calculated from a combination of SOS and BUA. Partial correlations adjusting by age were applied between bone strength variables (SOS, BUA and SI) and handgrip strength values.

RESULTS

Positive weak correlations were found between SI, BUA and the average handgrip strength of both hands ($r=0,30$ and $r=0,27$; both $p<0.05$).

CONCLUSION

Depite the correlations showed are not very strong, it is possible that handgrip strength dynamometry might be useful as a predictor to determinate bone health in institutionalized elderly population. Further studies assesing and controlling by other factors related to bone mass such as physical activity or diet are needed in order to either confirm our results.

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THE INFLUENCE OF PHYSICAL ACTIVITY ON BODY COMPOSITION IN INSTITUTIONALIZED ELDERLY PEOPLE

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INTRODUCTION

It has been shown that fat mass increases during the aging process (1). However, fat free mass decreases over the years (1). These physiological changes lead to increased disability and mortality in the elderly. Therefore, the aim of the present study was to evaluate the influence of physical activity on body composition measured with bioelectrical impedance analysis (BIA) in institutionalized elderly population.

METHODS

Thirty seven residents older than 69 years participated in this study.

Physical activity (PA) was measured using the Actigraph gt3x accelerometer (Actigraph, LLC, Pensacola, FL, USA). PA was categorized in to sedentary (SA), light (LPA) and moderate (MPA) intensities according to the cut-off established by Freedson (2). Fat mass (FM) and fat free mass (FFM) were measured with BIA TANITA BC 418-MA (Tanita Corp., Tokyo, Japan). Partial correlations adjusting by valid time (total time wearing the accelerometer) were applied to check the relationship between PA intensities and BIA variables.

RESULTS

Total minutes of LPA and MPA were positively correlated to FFM in this population ($r=0.405$ and $r=0.348$; $p<0.05$). No correlations were found between FM and total minutes of PA in any intensity.

CONCLUSION

FFM is positively affected by LPA and MPA intensities in institutionalized elderly population. This finding is of extreme importance as increasing FFM might reduce the risk of suffering falls and thus reduce the risk of fracture and consequent morbidity and mortality (3). Thus, an active lifestyle increasing LPA and MPA with some exercises such as walking or cycling may improve health in elderly people.

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Poster

MAXIMAL GAIT SPEED: FUNCTIONAL PERFORMANCE PREDICTION IN OLDER RESIDENTS IN LONG- TERM RESIDENTIAL CARE FACILITIES

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INTRODUCTION

Gait speed is a performance-based objective method utilized to asses the function of lower extremities in older people (2). It is also a reliable test for clinical context, under chronic conditions, including cognitive impairment (2, 4-6). Institutionalization (nursing or residential care facilities) is associated to a high functional decline. This study investigates the relationship between 6 meter maximal walking speed and functional independence for older adults in long-term residential care facilities. Understanding this could be particularly relevant to preserve-increase functional independence of older adults.

METHODS

107 institutionalized older adults (Mean age 80, 49 ± SD 5.51; 31.8% men and 68.2% women) were tested with two photoelectric cells (6m distance)connected to a chronometerfor maximal gait speed with allowance for acceleration (2 m) and deceleration (2 m). Two years and a half latter functional performance was determinedby a) the independence to walk 20 m (1), b) 6 minute walk test (7) and c) The Short Physical Performance Battery (SPPB)(3). Independence score (=1) were assigned for functional independence if: a) they were able to walk a distance of 20m without assistance or the use of walking devices (1), b) they covered a distance of at least 300m in 6 minute walk test (7), or c) they scored at least one in each domain of SPPB (chair stands, standing balance and 4 m walk test) (3), Binomiallogistic regressionanalysis was used to assess the risk offunctional dependenceassociated with fast walking speed normalized by height, age and gender.

RESULTS

A binarylogisticregression revealed that maximal walking speed (m/s), normalized by height (m), is a significantvariable that predicts functional dependencedetermined aloneby inability to "walk 20 independent" (p=0,018; 36,901%), "cover 300m or more in 6 minutes" (p=0.011; 46,654%) or"score at least 1 over 4 in each domain of SPPB (p=0.008; 57,711).

DISCUSSION

The prevention of physical disability is a primary gold for geriatric medicine(4). Gait speed is a quick, inexpensive, reliable measure of functional capacity with well-documented predictive value for major health-related outcomes (6). Maximal gait speed could be recommended as a predictive test for functional independence-dependenceassessment in older adults living in long-term care institutions. Keywords: Gait speed, functional performance, long term-care, older.

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Poster

PHYSICAL ACTIVITY AND SELF-PERCEIVED HEALTH: AGE AS MODERATOR

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INTRODUCTION

Physical Activity (PA) practice regularly has numerous benefits on health (decrease risk factor for non-communicable diseases, number of main major chronic diseases and the severity of disease along time) also including feel good about oneself (general well-being and self-esteem) (4, 6). Physically active subjects spent less time being sedentary. As we grow-up, health status and the amount (quantity), and especially intensity of PA decrease (9). The main aim of the study is to analyze the impact of PA on self-perceived health and to test this impact by age group.

KEYWORDS

Self-perceived health, Physical activity, Ageing, Intensity.

METHODS

In order to quantify the respondents' level of PA, the questionnaire applies the "International Physical Activity Questionnaire" (IPAQ) (1, 8) that results in two different variables indicating the Metabolic Equivalent of Task (MET); 1) total, as well as by 2) intensity of PA. Intensity is also subdivided in three different categories2a) vigorous PA, 2b) moderatePA and 2c) walking PA. The questionnaire also estimates self-perceived health through the application of the EQ-5D-5L questionnaire (2). From this a numerical variable with values from 0 to 100 is obtained by applying a standard vertical 20 cm visual analogue scale (similar to a thermometer) in order to record the individual's rating for their current state of health-related quality of life. A number of control variables based on socio-demographic issues and use of sanitary services are used. The data has been obtained from the "EncuestaNacional de Salud de España (ENSE 2011-12)" with a representative sample of 21,000 Spanish individuals. Ordinary least squares models are used.

RESULTS

The amount of physical activity undertaken in general, as well as by intensity, increases perceived health. Regarding the intensity of physical activity, vigorous activity has the greatest impact on perceived health, while walking has the lowest. Self-perceived health decreases with increasing age but, it should be pointed-out that the effect of physical activity and low intensity activities (walking) on self-perceived health is higher as we age. This means that physical activity and walking have the greatest effects on self- perceived health comparing older peopleto adults and young. However there are no differences in the effect of vigorous physical activity and of moderate physical activity on perceived health by age group.

DISCUSSION

In line with indications of several health international entities and previous studies (7), the amount of physical activity undertaken is a good alternative to prevent illness and to reduce sanitary costs associated to the treatment (4, 5). Moreover, in accordance to this and previous results (3) seems reasonable to encourage older people to undertake physical activity in general and walking in particular. On this population studied walking is a good practice since it has the greatest effects on self-perceived health.

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Poster

FITNESS ASSESSMENT AND HEALTHY PHYSICAL EXERCISE PRESCRIPTION IN ELDERLY THROUGH COMPUTERSOFTWARE

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INTRODUCTION

The increasing popularity of physical activity practice in elderly people (EP) and Institutions interest to progressively provide a wider range of health activities, in addition to the necessary quality of an assessment tool healthy state of the EP (2), the creation of an advisory system, special assessment and prescription of physical activity for this population seems necessary. The aim is to create a software application that serves as a support for physical exercise for health (PEH) prescription in EP (1-3-4). Once analyzed the literature, we propose the Web Management System Physical Activity and Health program as the basis for prescribing PEH.

METHODS

Medline, SportDiscus and Dialnetwere the database followed in the bibliography and literature refered to physical activity and health in EP. Developping the software, different methods of computer programming were used, which generated specific commands for entering, managing and handling all information collected about the user to prescribe PEH based on all data. Following this establishment we began to consult guidelines and recommendations from several authors and organizations to build up database of exercises, questionnaires and assessment procedures healthy condition in each subject (2), on body composition and medical history.

RESULTS

Web Management System Physical Activity and Health application was created. This software is created in web format, and consists on several screens where personal data will be managed in first instance, and moreover concretes the diagnosis with further information to reach a higher level of specificity in prescribing PEH. Following windows will proceed to gather information to accommodate all members of a multidisciplinary health team. Subsequently, data on body composition and anthropometric measurements were collected, generating automatically a somatochart (1).

DISCUSSION

We have tried to create a tool that could provide those responsible for prescribing PEHespecially in EP (4-5), the means to manage, evaluate, schedule and to keep track of the activity. Creating Web System Physical Activity and Health Management meets the targets to perform the proposed study. Our final conclusion is that we have created a tool that responds to the needs of health professionals (3-4), allowing individual monitoring of this group, so they can prescribe PEH with scientific results (5).

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ANALYSING THE DETERMINING VARIABLES IN THE LONG JUMP EVENT PERFORMANCE IN DIFFERENT AGE CATEGORIES WHILE COMPETING

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INTRODUCTION

During the past few years, numerous biomechanical studies have been conducted on the long jump event, some of them at international competitions. However, there are very few studies analysing and comparing athletes in other age categories during a competition. The purpose of this study is to find out if the determining variables in the long jump event are the same in the different age categories.

METHODS

The finals of 12 indoor long jump 2013 championships were analysed in cadet (14-15 y/o), youth (16-17), junior (18-19), under 23 (20-22) and absolute categories in Catalonia, as well as the absolute category in Spain. The study sample was made up of 103 athletes (56 men and 57 women), analysing only their best jump in each competition. The space (runway and sandpit) was calibrated and 3 Casio EXF1 cameras were used, recording at 300 fps, another camera recording at 30 fps in HD, 3 Microgate Polifemo Radio photocells placed at a distance of 1, 6 and 11 metres from the take-off board and a Stalker ATS II radar. 54 quantitative variables related to distance, time, speed and angle during the approach run, take-off, flight and landing were extracted from every jump.

RESULTS

On the sample as a whole, the linear discriminant analysis shows a significant relation between the official jumping distance (dependant variable) and the speed on the antepenultimate, penultimate and last stride ($p<0.01$; $p<0.000$; $p<0.001$), time of board contact ($p<0.036$) and the height of the centre of mass on the flight phase ($p<0.000$). Using this data, a linear regression model is built for the group of athletes: Official jumping distance (m) = -0.761 + 0.158 · Vp_3 (m/s) + 0.257 · Vp_2 (m/s) + 0.133 · Vp_1 (m/s) - 3.866 · Tc_0 (s) + 0.036 · h_0 (cm). However, when analysing each championship separately, other variables where found showing a relation between the official jumping distance and the age category, thus obtaining different models of linear regression for each age category.

DISCUSSION

The variables that better explain the performance in the long jump event during a competition vary depending on the athletes' training level and age category. This could be used as a reference in training programmes for the different age groups.

Despite the fact that no championship has got the same determining variables, there is however a common characteristic among all of them: they all have variables related to velocity.

Additionally, in every championship, at least one of the variables was related to the take-off. We can thus confirm the importance of reaching a higher speed in the final phase of the approach run as well as the importance of the take-off.

Poster

TEST-RETEST RELIABILITY OF BARBELL VELOCITY DURING TRADITIONAL AND BALLISTIC BENCH PRESS EXERCISE

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INTRODUCTION

In order to gain muscular power coaches and researchers recommend ballistic exercises (e.g. Bench press throw [BPT]) rather than traditional resistance training exercises (e.g. Bench press [BP]), because the firsts are generally more sport specific and therefore may prompt adaptations that allow for greater transfer to performance (1). Thus, it seems contradictory that upper-body power is evaluated with BP exercise (1), because athletes can not develop their fullest potential (2). Besides validity, a good measurement must have good retest reliability (3). The comparison of retest reliability between BP and BPT seems not have been performed yet. Therefore, the aim of this study was to determine test–retest reliability for peak barbell velocity (V_{peak}) during the BP and BPT exercises for loads corresponding to 20-70% of 1-repetition maximum (1RM).

METHODS

Thirty college men conducted 4 evaluations after a preliminary BP 1RM determination (1RM·bw^{-1} = 1.02±0.16 kg·kg^{-1}). In a counterbalanced order, each day of evaluation was determined the individual load-velocity relationship at each tenth percentile (20–70% of 1RM) in a smith machine for BP or BPT. Recovery time between evaluations of the same exercise was 48h. Subjects performed 3 attempts per load, but only the best repetition (higher V_{peak}) registered by a linear position transducer (Globus linked to Tesys 400, Codogne, Italy) was analyzed. Paired t-test and coefficient of variation (CV) (3) were used to assess V_{peak} reliability at each percentage of the 1RM.

RESULTS

Mean scores values of V_{peak} (m·s^{-1}) were significantly greater (p<0.001) in BPT for all loads (%1RM [BP vs BPT]; 20% [2.36±0.13 vs 2.66±0.16], 30% [2.03±0.17 vs 2.27±0.13], 40% [1.69±0.15 vs 1.86±0.11], 50% [1.43±0.14 vs 1.56±0.12], 60% [1.14±0.12 vs 1.25±0.12] and 70% of 1RM [0.95±0.10 vs 1.04±0.12]). There were no mean differences in V_{peak} values from trials 1 and 2 for any of the exercises (BP or BPT) and intensities (20-70% of 1RM) analyzed. Results of absolute consistency (CV: %1RM [BP vs BPT]; 20% [3.8 vs 1.7], 30% [2.6 vs 1.8], 40% [2.6 vs 2.5], 50% [2.7 vs 2.5], 60% [3.6 vs 3.2] and 70% of 1RM [4.3 vs 3.2]) shown a good reproducibility of both exercises, being slightly higher for the BPT, especially with light loads (20-30% of 1RM).

DISCUSSION

Present results show higher reliability compared to reliability reported in the free-weight BP (4). In addition, our results reaffirm higher velocities of BPT in comparison to BP in a wide range of loads (20-70% of 1RM). Both, validity and retest reliability seems to be higher for the BPT. Therefore, we recommend BPT for the accurate assessment of the training intervention.

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Poster

SUPRASPINATUS MUSCLE CSA DIFFERENCES IN SPORTS MEN WITH AND WITHOUT SHOULDER PAIN

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INTRODUCTION

Ultrasound examination is a fast and easy use image technique (1). The Cross Sectional Area (CSA) is the surface that is delimited when a perpendicular slide towards the mechanical axis of a muscle is made, and it has been widely used in literature because of the reasonable simplicity of its utilization and because it is a good real size indicator of the muscle (2). Our purpose is to find the differences in the USCSA between an Intervention Group (IG) formed by athletes with shoulder pain during their sport practice, and a Control Group (CG).

METHODS

This is an observational, transversal and comparative study, with 72 male athletes (CG n=36, and Intervention Group, n=36), who predominantly use their upper limbs to perform the main sport gestures. The purpose of our study is to find the association betweenultrasound imagingCSA and shoulder pain in throwingathletes. Ultrasound imaging CSA was used to visualize the shoulder, and pain was assessed by the use ofa Visual Analog Scale (VAS).

RESULTS

T-test showed meaningful differences (p=0.001) when comparing the average values between groups. Our study showed that Control Group had asuperior dominant arm's CSA(815,11 mm^2) compared with the Intervention Group (747,05 mm^2), being less manifested in the non dominant arm (762,88 mm^2 Control Group; 756,27 mm^2 Intervention Group). We also detected an increase in muscle trophism or CSA when we compared the dominant and the non dominant arm in the Control Group (815,11 mm^2 and 762,88 mm^2).

The opposite finding was observed in the Intervention Group, which had greater values in the non dominant arm (747,05 $mm^2$and 756,27 mm^2).

DISCUSION

The difference between the Ultrasound Imaging CSA of painful shoulder and normal shoulder could be used as a reference value to detect supraspinatus atrophy, and therefore, to suggest a functional rehabilitation program according to this findings.

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Poster

PERCEIVED COMFORT ASSESSMENT OF CUSTOM-MADE AND PREFABRICATED ORTHOSES DURING RUNNING

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INTRODUCTION

Although running is associated with many benefits for the health, runners are exposed to a higher injury risk due to its practice. The use of specific cushioning structures such as orthoses has recently been suggested to have the potential to assist in absorbing skeletal impact transients (1). However, there has also been some controversy regarding the use of "over-the-self" or custom-made insoles when aiming to enhance performance and prevent running injuries. In this sense, comfort is becoming an essential element in orthosis design since discomfort alters the running biomechanics of the athlete and ultimately may compromise performance and increase the risk of injury (2).

METHODS

This study analysed the perceived comfort of three types of orthoses: custom-made, prefabricated and the original insoles of the running shoes. 40 runners analysed nine comfort variables (overall comfort, heel cushioning, forefoot cushioning, medio-lateral control, arch height, heel cup fit, shoe heel width, shoe forefoot width, and shoe length) for each insole condition.

RESULTS

Greater comfort scores were observed when using both the custom-made (medio-lateral control, arch height, heel cup fit, overall comfort, heel cushioning, forefoot cushioning) and the prefabricated (medio-lateral control, arch height, heel cup fit, overall comfort, heel and forefoot cushioning, forefoot width) insoles compared to the original insoles of the running shoes. Moreover, prefabricated insoles were rated slightly higher than custom-made inserts, although the differences were not significant.

DISCUSSION

The perceived level of comfort of footwear is considered to be a protective measure of the potential risk of running injuries. We found that, even though custom-made orthoses are closely matched to each individual's foot, such customization does not necessarily imply greater comfort when compared to prefabricated insoles. We also found that both study insoles (custom-made, prefabricated) were perceived significantly more comfortable than the original insoles of the running shoes. These differences are relevant and may result in actual modifications in the running pattern.

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Poster

EFFECT OF COMPRESSIVE GARMENTS AND FATIGUE ON IMPACT ACCELERATION DURING RUNNING

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INTRODUCTION

Every time the foot contacts the ground during locomotion a vertical force travelling up the skeleton through the ankle joint to the head is produced. This transient wave, known as "shock-wave", is attenuated by the musculoskeletal system on its way up to the head. However, these forces create vibrations, which, if unattenuated, could interfere with the visual-vestibular sensory systems in the head (1). In this sense, compressive garments are believed to reduce vertical muscle oscillations (2), which could lead to a reduced upward shock-wave. Therefore, the purpose of this study was to analyze the effect of compressive garments on the behaviour of running parameters and impact acceleration during a fatigue run.

METHODS

Forty runners participated in the study. The effects of compressive stockings (compressive [C] and placebo [P] garments) on running parameters (stride rate [SR], stride length [SL]) and accelerationvariables (tibia and head peak and minimum impact value, tibia and head impact rate (ratio between peak value and the time between minimum and peak values) and shock attenuation) were analysed every 5 min (T0, T5, T10, T15, T20, T25, T30) throughout a fatigue run (30 min at 80% of the individual's maximal aerobic speed [MAS]) on a treadmill.

RESULTS

No differences in SR and SL were observed for any condition. Tibial peak acceleration (both for C and P) and tibia impact rate (only for P) as well as shock attenuation increased as the runners got fatigued. Between-garment comparisons showed similar tibia and head peak impacts, but higher head and tibia minimum values for the compressive garment, leading to reduced impact loading magnitude.

DISCUSSION

Running fatigue increased impact values at the tibia, what may lead to potential overloading when running over a long period of time. It is of great interest, however, that shock attenuation by the musculoskeletal system also increased throughout the run, leading to similar head impact values regardless the increase in tibia loading, what may be explained by changes in muscle activity as a strategy to protect the body as described by the muscle tuning paradigm (3).

Finally, the lower loading magnitude observed with the compressive garments may be considered as a protective aid when aiming to reduce impact loads during running, and it may provide indirect support to the decreasing muscle vibration effect of compressive garments.

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Poster

QUANTIFICATION EXTERNAL LOAD OF YOUNG SOCCER "7" PLAYERSIN 1-3-3 GAME SYSTEM

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INTRODUCTION

In football, the activity standard of adult players, both male and female ones, has been studied at great length. However, those studies focused on the analysis of young soccer players' displacements are very limited (1). In the present study we have analyzed the activity profile in young soccer "7" players (mean age 11.17 ± 0.73 years, N = 39) in competition.

The objective has been to determine the physical demands of the sport as the position of a player in 1-3-3 game system.

METHODS

To obtain the data, it was placed GPS receiver SPI Elite (GPSports Systems, Pty. Ltd., 2003, Australia) in the players, and the data captured were analyzed using the software AMS GPSportss Team subsequently. The variables studied were distances and time in each of the categories of intensity defined by Castagna et al. (2003) for young football players (2). Players were analyzed for 15 games a time of 25 minutes.

RESULTS

The average distance covered by playerof the 1-3-3 game system was 2223.28 ± 148.48 m, these values indicate an average speed of 88.93±5.94m per minute. The results indicate that the work-rest ratio of this system was 1:1.82. The category where players will travel at a speed of 3.1-8 km / h (light jogging) is the area where more time (52.24 ± 4.34%) were kept and where more distance traveled (1126 ± 101.29 m) the players of this game system. The right forward is the player who runs more meters (2318.63 ± 154.7m). The central defender and the left front players with work-rest higher and lower, 2.03±0.86 and 1.61±0.37 respectively.

DISCUSSION

The obtained results, attest that in football "7", the profile activity varies depending on the position of player in this game system. Significant differences exist ($p<0.05$)in the residence time and the distances covered, in each of the categories of displacement (3).With these results, the coach can meet the physical demands of each player according to its position in the 1-3-3 game system. It being possible make appropriate substitutions for competitive burden falls on all players equally, avoiding specialization player positions in training period.

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Poster

XVTH WORLD SWIMMING CHAMPIONSHIPS: RACE PHASES' CONTRIBUTION TO THE OVERALL PERFORMANCE AND THE GENDER DIFFERENCES

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INTRODUCTION

Over the last years, competition analysis has become a regular feature in most international swimming events (1). The swimming race is considered as the succession of various phases (2), start, swim, turns and finish, where, depending on the race distance, each one contributes differently to the overall performance (3). Analysing this contribution could help coaches to focus the training on the swimmers'weaknesses. The aim of this study is to present the race phases' contribution to the overall performance,as well as, the relatedgender differences observed at the XV World Swimming Championships.

METHODS

A semi-automatic software (4) was used in the analysis of the XV World Swimming Championships. Official time results were shared through the official website (5). Afterwards, 51 Semi-finals and 32 finals events (8 swimmers per event) were analysed, calculating the contributionof each phase to the overall performance.

RESULTS

In 50m events, starting time (ST) represents a percentage of 24.08±1.10 in males (M) and 24.84±0.69 in females (F) in relation to the total time. In 100m, this percentage decreases(M:11.25±0.59, F:11.78±0.55) and keeps decreasing until the 800m (M:1.41±0.03, F:1.43±0.01). Gender differenceswere significant at the ST contribution ($p<0.001$) in 50m, 100m and 200m events. The finish phase' percentage of contribution also decreaseswhen distance increases. In 50m, M:10.28±0.34, F:10.17±0.39 and in 100m, M:5.16±0.19, F:5.10±0.18 while in the 800m, it was just M:0.58±0.04 and F:0.58±0.01. In this phase, gender differences were only significant($p<0.05$) in 50m and 100m events. Contribution of turning time increased beside the race distance: from 19.4±0.5 (M) and 19.66±0.43 (F) in 100m events, to 35.65±0.22 (M) and 35.82±0.17 (F) in 800m. Gender differences were significant in 100m, 200m ($p<0.001$) and 400m events ($p<0.05$). The swim phase contribution was quite similar in all the distances: In 50m, M:65.64±0.99 and F:64.99±0.71 while in 800m, M:62.36±0.24 and F:62.17±0.18. Differences between genders were significant ($p<0.001$) in 50, 100 and 200m events.

DISCUSSION

Therace phases' percentage ofcontribution showsan updated situation of the elite swimming performance which, could be useful for coaches in order to focus on the swimmer's weaknesses. Moreover, the genderdifferences found ($p<0.001$, $p<0.05$) in each of the phases, imply the need of developing different technical training for men and women in the 50m, 100m and 200m events.

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Poster

INFLUENCE OF FATIGUE ON LOWER LIMBS IN LANDINGS WITH DOMINANT FOOT

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INTRODUCTION

Researchers agree that injuries in lower limbs represent between 50-60% of total lesions (1), being the landing situations where increases the risk of injuriy of knee and ankle (2-3). Our aim is to analyze the effect of fatigue in the stabilization of the knee in landings with dominant foot.

METHODS

Fifty-five volunteers (age = 23.85 ± 2.9 years; heigth = 1.74 ± 0.09 m; weight = 72.35 ± 12.85 kg; BMI = 23.60 ± 2.72 $kg \cdot m^{-2}$). They jumped from a 30-cm height in two different conditions: (i) prefatigue (3-attempts with a minute of rest between every attempt) and (ii) after being maximal voluntary contraction (MVC): postfatigue (single attempt). The stabilization´s time (tEst), ground reaction forces (GRFs), valgus-varus forces and supported in tibial translations. Also, obtained data on the mechanical impulse in each attempt.

RESULTS

The tEst was significantly greater than prefatigue ($p<0.05$). In addition, subjects showed a significantly greater impulse in postfatigue ($p<0.05$). However, GRFs, valgus-varus forces and supported in tibial translations weren´t significantly increased in any situations regarding fatigue, thought it was observed that the trend was similar attempts postfatigue all parameters.

DISCUSSION

As tEst (3) as impulse (4) are parameters related to increased risk of injury. Our results support the increased risk injuries for fatigue in relation to the kinematics of the movement (3-4). One possible answer might be a longer tEst and impulse in fatigue subjects found. Our results show there is a significantly greater action-time of the forces supported by joint, and forces are higher when subjects are fatigued too.

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THE INTERACTION BETWEEN INTRA-STRIDE VARIATION OF THE VELOCITY AND MEAN RACE WALKING VELOCITY

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INTRODUCTION

The intra-stride/cycle variation of body velocity (dv) is considered as an estimator of the energy cost of locomotion or efficiency in some forms of human locomotion, including waking, running, trotting and swimming (1, 2). Previous studies reported nonlinear relationships between dv and velocity (v) for land and aquatic locomotion techniques (2,3). The aim of this study was to examine possible relationships between the dv and the v in race walking.

METHODS

After a standard warm-up, eight female junior high level race walkers performed 3 trials of 60m dash at competitive pace.A wireless tri-axial accelerometer was attached to the athlete's low back (i.e aligned with L3). The equipment thereafter was leveled in both the coronal and sagittal plane. Bio-signal was acquired by Bluetooth at a sampling rate of 1kHz, and with a 12-bit resolution. Before each data collection, the accelerometer was statically calibrated on a flat and even surface. Data was exported to a signal processing software and filtered according to residual analysis [4.3–5.8Hz] with a cut-off low-pass 4th order Butterworth. Instantaneous resultant velocity was calculated through numerical integration of the signal magnitude acceleration. The dv was analyzed as previously described elsewhere (3). For further analysis the mean dv value of 10 consecutive cycles, after the 10th m from the starting point, was considered.

RESULTS

Intra-cycle variation ranged between 15.0–24.2% for an average velocity of 2.98±0.06m/s. Quadratic regressions were the ones with the best goodness-of-fit and the lower error of estimation for the dv-v relationship (R^2=0.801; R^2_a=0.782; SE=0.026; p<0.0001).

DISCUSSION

Athletes able to achieve a higher v showed a lower dv, suggesting an enhanced economy of movement. As economy of movement is one of the most important biomechanical factors to consider aiming high performance in all endurance sports, the proposed methodology can be used to discriminate between race walkers exhibiting similar mean velocity. The findings suggested that intra-stride variations of the velocity of the body can be used as an informative variable to learn about the performance level of a race walker.

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Poster

NOTATIONAL STUDY OF THE SHOTS AND MOVEMENTS IN PADEL TO IMPROVE TRAINING DESIGN

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INTRODUCTION

Padel is an attractive sport for everyone. The number of padel player licenses has increased 101% from 1998 to 2011. Despite this evolution, there is a significant lack of scientific papers focusing in padel, specifically analyzing the quantification of movements and shots during match. The objective of the study was to perform notational analyses of movements and shots in padel in order to establish the importance of each type.

METHODS

Along ten matches, twenty male professional players were video recorded. Later, their movements (lateral, head-on and backward displacement, split-steps, jump for a smash, and turns pivoting on the foot) and shots (direct and indirect drive, backhand, smash and lob, and direct volley) were identified, quantified and classified.

RESULTS

The frequency of movements every five minutes of the match was: Lateral displacement (16.1), head-on displacement (13.3), split-step (7.5), jumps for a smash (2.8), backward displacement (1.36), pivoting on the foot (1.2). Shot percentage of the match was: direct volley (24.6%), indirect lob (20.5%), direct smash (17.7%), indirect backhand (14.7%), indirect drive (14.5%), direct backhand (2.6%), indirect smash (2.3%), direct drive (1.8%) and direct lob (1%)

DISCUSSION

Results show that lateral displacement represents the most executed displacement, followed by head-on displacement and split-step. Similarly to tennis (Kovacs, 2009), lateral displacement has a predominance over other movements in padel. Also, results suggest that head-on displacement has a large presence in the padel, and jumps have to be considered for their importance in joint injuries. The quantification of the shots show the relevant occurrence of direct volley, indirect lob, direct smash, indirect backhand and indirect drive. Frequency of movements and shots analysis provides worthy knowledge to characterize the physical demands and this information allows improving training design (Bloomfield et al., 2007). However, this kind of knowledge has not been completely covered in padel. Present results partially improve this situation, providing worthy information to improve the design of more specific field tests and training sessions for padel players.

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Poster

INFLUENCE OF THE NUMBER OF PLAYERS AND THE RELATIVE PITCH AREA PER PLAYER ON PHYSICAL PERFORMANCE IN UNDER-13S MALE SOCCER

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INTRODUCTION

In junior or youth soccer the competitive format needs to be adapted to the characteristics of those involved, and consequently the rules are often modified to suit the physical development of children and youngsters (1) and to make it easier for them to take part. The aim of this study was to examine the influence of different competitive formats on physical performance in under-13 soccer players.

METHODS

Twenty-four players from the youth academy of an elite team from the Spanish first division. The order in which the nine possible competitive formats (3 levels for the number or players (NP): 7, 9, or 11 players per side x 3 levels for the relative pitch area (RPA) per player:100 m^2, 200 m^2, or 300 m^2) were played and recorded was established randomly.Physical performance was measured using a portable GPS device operating at a sampling frequency of 10 *Hz* (MinimaxX v.4.0, Catapult Innovations).

RESULTS

The results support the hypothesis that the change in dimensions affects more than the number of players in locomotor activity. Specifically, an increase in the relative pitch area per player was associated with higher values of the following variables: distance covered, work: rest ratio, player load and percentage of time spent in both absolute (above 8 $km \cdot h^{-1}$) and relative speed categories (above 40% of V_{max}).

DISCUSSION

The main finding was that physical performanceswere influenced more by the RPA variable. Specifically, the demands on players increased more as a result of an increase in the RPA per player (2,3) than as a result of a decrease in the number of players per team, so we can confirm the hypothesis. These results could help youth soccer coaches to plan the progressive introduction of different competitive formats so that task demands are adapted to the physical development of participants.

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Poster

EFFECTS OF INCREASING LOADS ON GRF DURING EARLY ACCELERATION OF A SLED-TOWING EXERCISE

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INTRODUCTION

Resisted sprint by towing a weighted sled has become in a common training method to improve acceleration ability (1). However, its effects on kinetics parameters are unclear. A greater understanding of ground reaction forces (GRF) during the stance phase could explain better the processes underlying this training method. The aim of present study was to determine the effects of different loads on GRF during first step in a sled-towing exercise.

METHODS

Eighteen semi professional soccer players (3rd Division level) participated in this study. Subjects performed 6 sprints under 3 different conditions: unloaded, towing a low load (12% of their body mass (Bm), and high load (32% Bm). Peak and mean values of horizontal –propulsion-, vertical and resultant GRF were recorded during first step of every sprint over different conditions. GRF relative to Bm were also calculated.

RESULTS

Repeated measures-ANOVA revealed significant decreases for mean horizontal propulsive (between 0% and all loaded conditions), vertical (between 0% and 32%: 940.44 ± 137.23 N and 884.52 ± 98.11 N, respectively) and resultant (between 0% and 32%: 945.8 ± 136.59 N vs 885.11 ± 98.2) GRF. For peak forces, significant differences were found in horizontal propulsive forces (between 0% and 12%: 168.66 ± 44.96 vs 138.73 ± 44.13 N).

DISCUSSION

Towing a weighted sled causes a decrease in both horizontal and vertical GRF during first step of sprinting. GRF have been widely described during few first steps (2-3). Nevertheless no one has focused on GRF when athletes towing a weighted sled.

Greatest forces –absolute and relative- in both horizontal and vertical axis, are achieved when athletes run without external load. This may occur due to a deterioration of sprint technique (4), and therefore a less efficiency generated under weighted conditions. Further research is needed to determine whether GRF play a key role on kinetics of resisted sprint training.

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PHYSICAL AND PHYSIOLOGICAL DEMANDS WHEN VARYING THE NUMBER OF OPPONENTS DURING FOOTBALL SMALL-SIDED GAMES PLAYED BY PROFESSIONALS AND AMATEURS

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INTRODUCTION

The aim of this study was to determine how the number of opponents (3, 5 and 7 opponents) affects the external and internal workload, when four professional and four amateurs footballers play small-sided games.

METHODS

Eight professional (age: 29.0 ± 3.6 years; height: 180.3 ± 7.4 cm; weight: 74.8 ± 7.9 kg) and eight amateur football players (age: 23.0 ± 0.8 years; height: 179.6 ± 6.5 cm; weight: 72.3 ± 6.3 kg) participated in a cross-sectional study. Twenty-four small-sided games were played by four teams (two professional and two amateur) of four players, against an opposition of 3, 5 and 7 players. All games were played in a 40x30 meters pitch in a random order and with a total of 3 min duration. The time-motion and body impact data were collected using a 15Hz non-differential global positioning system with integrated 1Hz heart rate belts. Differences in external workload (body load, BdL; total distance covered, DC; exertion index, EI) and internal workload ($TRIMP_{MOD}$) between the different oppositions were compared using Cohen's d_{umb} Effect Sizes with 95% Confidence Intervals.

RESULTS

Both professional and amateurs players presented lower values across all considered indicators: BdL (58.18±7.92 and 54.04±12.12, respectively), DC (358.87±35.80 m and 347.37±46.33 m, respectively), EI (4.15±0.70 and 3.94±0.97, respectively) and $TRIMP_{MOD}$ (9.01±1.97 and 10.82±1.92, respectively) when facing 7 opponents. These differences were considered small to large (d_{umb} ranged from 0.37 to 1.42).

The analysis showed that playing in superiority (against 3 opponents) and moderate inferiority (against 5 opponents) had similar external workload demands (i.e., all the 95% Confidence Intervals for d_{umb} crossed zero). When compared to amateurs, the professional players showed higher external workload across the games and lower internal workload ($TRIMP_{MOD}$: 12.01±0.99 and 13.06±0.90 against 3 opponents; 11.19±1.65 and 13.29±0.57 against 5 opponents; and 9.01±1.97 and 10.82±1.92 against 7 opponents).

CONCLUSIONS

The results suggested higher physical demands and lower physiological performances in the professional players. Also, playing against 7 opponents promoted substantial decreases in internal and external workload and, therefore, coaches should be aware that the physical and physiological estimulus in these situations is likely diminuished.

Poster

CONCURRENT VALIDATION OF THE OMNI-RESISTANCE EXERCISE SCALE OF PERCEIVED EXERTION WITH SUSPENSION TRAINING DEVICES

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INTRODUCTION

Suspension devices for physical conditioning have increased the available tools of the professionals that use devices to provoke instability (1). Quantifying exercise intensity with Suspension devices training session is difficult because there are four different ways to change it. The purpose of this study was the validation of the OMNI-Resistance Exercise Scale of perceived exertion (2) with suspension training device.

METHODS

29 physically fit and healthy subjects took part in the investigation. Muscular activation was evaluated in Triceps Brachii, Upper Trapezius, Anterior Deltoid, Clavicular Pectoralis, Rectus Abdominis, Rectus Femoris, Lumbar Erector Spinae and Gluteus Maximus during execution of 5 repetitions of the push-up exercise at two positions: low height (pos1) and 45 degrees (pos2). Surface electromyography was recorded and the average root mean square values were calculated for each condition and muscular group, also RPE was evaluated by OMNI-RES scale. The conditions were counter-balanced. The maximum isometric voluntary contraction (MIVC) was evaluated for the normalization of the electromyographic signal (EMG). All values, expressed as the % MIVC for EMG, and 0 to 10 for RPE, were compared through ICC index for RPE values between sessions, Student's paired T-test analysis for EMG and RPE was used. Significance level was set at $p<0.05$.

RESULTS

ICC index for RPE pos1: 0,972, for pos2: 0,988. Student´s paired T-test analysis for OMNI-RES was -0,8 p=0,001 and -0,006 for EMG. Differences between EMG and RPE in the two different positions showed concurrent validity. CONCLUSION: OMNI-Resistance Exercise Scale of Perceived Exertion with Suspension Training Devices is good for measurement intensity of exercises. RPE OMNI-RES can be used for indications about intensity in training sessions with Suspension Training Devices.

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Poster

BONE STRENGTH INDEX AT TIBIA AND STANDING BROAD JUMP IN ADOLESCENT SWIMMERS

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KEY WORDS

Bone strength, Swimmers, Adolescents, peripheral quantitative computed tomography (pQCT).

INTRODUCTION

Measurement of broad jump is a simple, economical and non-invasive test that provides valuable information on muscular strength and power in youth lower limbs(1),and has been shown to be related to bone health(2). A recent review focusing on bone health in swimmers (3)showed that adolescent swimmers present lower bone mineral density than sedentary controls, and therefore might be at a higher risk of suffering bone fractures. Thus, the aim of this study was to ascertain whether a relationship between distance jumped in broad jump and bone strength indexesactually exists in adolescent swimmers.

METHODS

Peripheral quantitative computed tomography (pQCT) measurements were taken at the tibia of 73 adolescent swimmers (32 girls) from 12 to 18 years. Stress strain index (SSI), and resistance to fracture load (FRC_LD) were calculated in X and Y axis. Bone strength index (BSI) and polar strength strain index (SSIPol), which is an estimate of bone strength to bending and torsion were also calculated. Three broad jumps were performed by each participant and the distance jumped (cm) recorded by the same researcher being the best performance (i.e. longest distance) selected for the analyses. Age-controlled partial correlations were applied to identify possible relationships between bone strength variables anddistance in broad jump.

RESULTS

All bone strength indexesshowed medium correlations with distance in broad jump (from r=0.42to r=0.50, $p<0.05$).

CONCLUSION

Distance in broad jump, could be used as a predictor to determinate whether an adolescent swimmer might be at higher risk of bone fracture. This finding is of special importance due to the weaker bone that this population presents (3), making initial screening of extreme importance.

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Poster

DIFFERENCE IN THE RATE OF LACTATE REMOVAL FROM RUNNING, CYCLING, ROWING AND ABSOLUTE REST AFTER A MAXIMAL TEST IN ROWERS

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INTRODUCTION

The recovery becomes a fundamental instance, mainly in sports that require multiple high intensity efforts within the same session of competition as in the case of rowing (1.2), due to high blood lactate concentrations [Lac] prior to the test would be linked to a reduction in athletic performance (3,4,5).

METHODS

In this study the rate of removal [Lac] concentration was compared between four methods (rowing , cycling, running and absolute rest) for 30 minutes at a controlled intensity (55-65 % of heart rate reserve) (Polar compared Team, Polar Electro , Finland), subsequent to a maximal rowing ergometer test at 2000m. In addition, it was determined whether adding a second clearance period 30 minute absolute rest, , help reach values of [Lac] possessed by athletes prior to the maximal test. 12 subjects participated in the study, but seven were completed successfully (age 21.6 ± 0.9 years, VO_{2peak} 63.6 ± 4.0 ml/kg/min^{-1}), who were randomized to complete the 4 methods removing every 72 hours. Samples [Lac] at rest, as maximum after test (0 minutes , 5, 10 , 15, 20 , 25, 30 and 60) (Lactate Pro II , Japan) were taken. ANOVA test was used with Tukey post hoc test to compare the variation within and between groups.

RESULTS

The results support the effectiveness of active over passive methods to significantly reduce the concentration of [Lac]. At 30 minutes, running, rowing, cycling and absolute rest reach values of 1.04, 1.51, 2.45 and 6.96 mmol/L^{-1}, respectively, over the values of lactate concentration resting. Moreover, by adding 30 minutes of absolute rest after 30 minutes of treadmill running the concentration of [Lac] closer to resting values (+0.09 mmol/L^{-1}) is achieved.

DISCUSSION

This research has corroborated (5) from a maximal test on 2000m rowers, that active methods are more effective than absolute rest to decrease the concentration of [Lac]. In this regard, it is important to note that the combination of 30 min of treadmill running at an intensity between 55-65% FCr plus 30 min of absolute rest, has proven to be the most effective in decreasing the [Lac] method to reach resting values. This should break the traditional thinking of the coaches that use the same exercise (rowing or rowing ergometer) to achieve this objective.

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EFFECTS OF TRAINING ON THE ANAEROBIC PEAK POWER IN PREPUBERTAL BOYS SWIMMERS

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INTRODUCTION

There is a scarcity in the literature about the effects of training in maximal anaerobic power in children athletes (Van Praagh, 2008).

Thus, the aim of this study was to analyze the differences in the peak power output (PP) between boys' swimmers before (B1) and after 6 months of training (B2), and compare it with boys without sport practice in the same assessment periods (C1 and C2, respectively).

METHODS

The sample was composed by: 10 B1 (age, 10.4±0.7 yr.; height, 142.26±7.59 cm; weight, 36.91±7.89 kg; body fat: 16.95±4.33 %) with an average of 2.1±0.32 years of training practice and competition; and 10 C1 (10.4±0.84 yr.; 145.29±5.88 cm; 46.92±11.13 kg; 24.76±4.45 %). After 6 months, the anthropometric characteristics were: 10 B2 (10.8±1.03 yr.; 143.93±7.98 cm; 37.39±7.37 kg; 14.55±3.24 %), and 10 C2 (10.5±0.97 yr.; 146.75±6.21 cm; 47.53±11.18 kg; 24.8±4.61 %). All participants were matched for Tanner's stage 1. Boys' swimmers completed 4 training session per week (typical swimming training with 98% aerobic and 2% of anaerobic power), with mean training volume of 2550±52.71 m.

To assess PP, participants performed the Wingate Anaerobic Test (WAnt) (Monark 894E), with a resistance of 75 g/kg (7.5% of body weight). Normality (Shapiro-Wilks test) and homogeneity (Levene's test) were assumed. The two-way ANOVA was used (SPSS, version 17.0) with a significance level of $p < 0.05$

RESULTS

The relative PP was 7.84±0.95 $W \cdot kg^{-1}$ and 8.21±0.82 $W \cdot kg^{-1}$ for the B1 and B2, respectively, and 6.98±1.1 $W \cdot kg^{-1}$ and 6.92±0.93 $W \cdot kg^{-1}$ for the C1 and C2, respectively. It was observed differences between groups (p=.001; effect size = .260), but no differences between the two assessment periods (p=0.612), nor between groups and the two assessment periods (p=0.473).

DISCUSSION

The prepubertal boys' swimmers presented significantly higher relative PP, and the body composition and sport practice might explain some of the differences between groups in the WAnt performance. Despite the slightly improvement in PP after 6 months of swimming training this was not significant, suggesting small differences in the anaerobic peak power in prepubertal athletes (Tolfrey, 2007), after this kind of training. However, the anaerobic performance improves mostly with children growth and maturation (Malina *et al*., 2004). Further studies are needed to perform sport-specific tests to evaluate the anaerobic power in prepubertal boys' and girls' swimmers.

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Poster

THE *HYPOPRESSIVE* METHOD AS HYPOXIC TRAINING AND THE IMPROVEMENT OF SEVERAL PARAMETERS IN SPORTS PERFORMANCE. A PILOT STUDY

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INTRODUCTION

The purpose of the hypoxics methods is to reduce the percentage of oxygen in blood (Sa02) to cause hormonal adaptations both level Erythropoietin, respiratory function, hemodynamic, metabolism, renal function and growth of blood vessels (1). The aim of this study is to demonstrate the efficiency of the Hypopressive Method (MH) as an intermittent hypoxic method, besides being a systemic training that will provide both improved several parameters.

METHODS

Two untrained subjects were exposed to a weekly run training method based on High Intensity Interval Training (HIIT) and three 30-minute workouts weekly of MH during 6 weeks. The control group performed only run training one day per week. The tests used were the Maximum Aerobic Speed (MAS) of Legger-Boucher, postural Kendall, the flexibility Toe Touch, and Pulmonary High Capacity and Maximum Flow with *Piko Nspire* handheld spirometer.

RESULTS

Subjects who used the MH got higher improvements in MAS test than those who did not use it. Overall improvements obtained were: postural improvements, increased flexibility of the posterior chain and improvements in spirometry test (PEF), which we could consider that are summations of the physiological benefits of hypoxia.

DISCUSSION

Previous studies have shown an improvement in hamstring flexibility after a MH program (2). With the improvements made in the PEF we could deduce that there is an adaptation of the respiratory muscle function in improving efficiency (3). The improvement achieved with static vertebral MH (4) could reflect muscle relaxation of the posterior chain and a balance in the overall tone of the body, which likewise could influence the economy of gesture. It seems that this set of global improvements may have caused an improvement in their aerobic performance.

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THE INFLUENCE OF THE TALENT DETECTION TESTS ON THE PERFORMANCE OF THE YOUNG SPANISH TRIATHLETES

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INTRODUCTION

The study to select talented triathletes has been focused mainly on the prediction of short-term results concerning their different performance factors (3). Bottoni et al. (1), andKovarova and Kovar (3) have recommended the use of field tests to achieve an accurate prediction of their efficiency.

METHODS

The results of the Spanish Federation of Triathlon and the results in the Spanish Championship of the same year were taken into account, concerning 489 youth and junior athletes, 342 men (69,9%) and 147 women (30,1%), in 2009, 2010, 2011 and 2012. The timing was taken in four events, which consisted of 100 (N1) and 1000 (N2) metres freestyle swimming, and 400(C1) and 1000(C2) meters running. An analysis of variance components ($p<0.05$), by least squares procedure and maximum likelihood was implemented, and an analysis of generalizability was performed. The SAS System for Windows v. 9.1, and the software SAGT v.1.0 were used to develop this analysis.

RESULTS

The sample to study is normal, linear andhomocedastic, and the levels of generalizability ($\Phi = 1$)and reliability($e^2 = 1$) of the structure of data of the athletes are excellent. The 1000 metres swimming tests and the 1000 metres running tests have proved a significant relationship ($p<0.05$), and a high explanatory capacity of the final position in the Spanish Championship, with explained variance percentage of 51,3% and 41,4 % respectively.

DISCUSSION

The high explanatory capacity of the tests N2 and C2 shows differences with the low explanatory capacity of the test N1 and the exclusion of the model in the test CI. This fact proves that the explanatory capacity of the tests of this talent detection programme to explain the results of the Spanish Championship, is limited. This restriction could be due to the performance of tests with a remarkable anaerobic component, such as the 400 metres event. Chavaren et al. (2) have claimed that the performance in triathlon is determined by the aerobic capacity, not by the anaerobic capacity. In this sense, hasbeen suggested a distance between 2 and 5 km for swimming and between 200 and 800 metres for running in order to be able to predict the efficiency of the triathletesin competition (1,3).

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Poster

TRIATHLON PERFORMANCE: SCIENTIFIC LITERATURE ANALYSIS IN WEB OF SCIENCE AND SCOPUS

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INTRODUCTION

Triathlon is a sport of resistance, which combines swimming, cycling and running. There are numerous distances, the olympic one covers 1,5 km swimming, 40 km cycling and 10 km running. The aim of this article is to analyze in a descriptive way, the investigation about the performance in triathlon in the olympic distance and in other inferior distances, using a bibliometric analysis as those used for the study of judo or economics of sport.

METHODS

A bibliometric analysis was made taking into account scientific publications from the most important data basis concerning sport, Scopus and Web of Science (WOS). The key words used to achieve the results of this study were "triathlon performance" and "Olympic or short or sprint or junior or youth". With this information, and the omission of duplicates and other articles about other distances, a total amount of 129, 101 articles from Scopus and 105 from WOS, were obtained for this study. The descriptive analysis was developed in two stages: a first stage by means of the personalised study of each data basis, and a global stage including the results of the two basis.

RESULTS

The first article was published in 1985, and the most productive years were 2003 with 14 articles and 2013 with 19. Most of the publications are original articles (81 articles). *Medicine and Science in Sports and Exercise* is the magazine with more publications (16), and France and Australia are the most productive countries. The 93 % of the articles are written in English. The writers with the most publications are Hausswirth and Brisswalter (1). (18 and 17 articles respectively) and they are the writers who have more links with many other authors (25 and 20 different co-authors in their publications respectively).

DISCUSSION

If we compare the results of this analysis with the results of Paset et al. (2), we can see that in the study about judo, the number of articles analysed was superior (384), most of them are original articles and they are written in English. The author with the most publications about judo (Franchini, E.) has the same number of publications as Hausswirth.

But he has more links with other writers (32). The magazine with the greatest number of publications is *Archives of Budo* (42 articles), and *Medicine and Science in Sports and Exercise* is in the 12th position with 6 articles. We can see in Sánchez, and Castellanos (3), that USA is the country with the most number of publications, whereas Australia and France are in the 5th and 10th positions respectively. Let us conclude by saying that the studies about performance in triathlon follow a pattern, which is very similar to the studies made in other sports.

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POST-EXERCISE RESPONSES TO AN ACUTE BOUT OF HIGH RESISTANCE CIRCUIT TRAINING VS TRADITIONAL STRENGTH TRAINING

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INTRODUCTION

Training intensity is determinant to modify excess post-exercise oxygen consumption (EPOC) and this parameter, normally is associated with an increased energetic needs (1,2). High-resistance circuit training (HRC), has been applied in resistance trained men to generate improvements in strength and body composition (3) with a reduced training time (4), but no studies that had demonstrated the physiological reasons to different finding between traditional strength training (TS) in reduction of fat mass.

METHODS

10 resistance trained men performed 3 sessions: familiarization, HRC and TS training. The order of training sessions was randomly and cross-over. The difference between protocols was the time of rest between exercises: TS=3´ and HRC=35". Local muscular rest was the same (3´) in both protocols. Resting and post exercise values of oxygen consumption (VO_2), respiratory exchange ratio (RER), heart rate (HR) and energy cost (EC) were measured with a portable gas analyzer in seated position before each training session, during 10´ and 20´ respectively.

RESULTS

During training session, significant differences ($p \leq 0.001$ were obtained between groups for EC (HRC = 6.0 ± 1.0 Kcal·min^{-1}; TS = 3.5 ± 0.6 Kcal·min^{-1}) and RER (HRC = 1.12 ± 0.03; TS = 1.05 ± 0.02). In post-exercise measurements (20´), significant differences were found for EPOC (HRC = 5.2 ± 1.4 L; TS = 2.3 ± 0.9 L) and EC (HRC = 2.5 ± 0.4 Kcal·min^{-1}; TS = 1.9 ± 0.3 Kcal·min^{-1}), while no differences between RER (HRC = 0.92 ± 0.05; TS = 0.91 ± 0.06) in both protocols.

DISCUSSION

During HRC, EC and RER were significantly higher than TS protocol. These results of HRC training were similar those reported by Beckham et al. (5) for EC in a study applying circuit weight training with medium loads, while for RER our results were slightly higher. Also, significant differences were found after training session in EPOC and EC. Other study (2), reported significant differences in EPOC and resting energy expenditure between similar training protocols values. Therefore, HRC protocol could be interesting for generate changes in body composition and aerobical fitness, as the EC and EPOC values are great during and after a training session with that protocol.

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Poster

ENHANCED POWER AFTER A 4-WEEK SUBMAXIMAL ISOINERTIAL TRAINING: A PILOT STUDY

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INTRODUCTION

The use of intermittent isoinertial maximal training has been shown to provide a form of eccentric overload exercise (1) and to improve strength (2) with minimal volume (4 sets of 7 maximal reps, 2-3 times a week for 5 weeks). Little research has been carried out on the effects of isoinertial training at submaximal intensity.

METHODS

Nine healthy male (n=8) and female (n=1) participants (age 35.4±8.4 years, weight 71.9±7.9 kg, height 173.9±6.4 cm, BMI 23.7±1.7 kg/m^2) volunteered and signed an informed consent to take part to the study, which was carried out according to the Declaration of Helsinki. The inertial mass of the flywheel was 1.8 kg and its radius 0.143 m (D11, Desmotec, Italy). The exercise was a semisquat movement performed so that concentric and eccentric phases were coupled in a closed kinetic exercise. As participants were "harnessed" just above the hip joint, the muscles moving the ankle, knee and hip joints were loaded concentrically and eccentrically at each repetition. After testing at baseline (peak power, Wpeak, and average power, Wmax) in order to set training intensities, subjects were asked to train twice a week for 4 weeks. Each session consisted of 8 to 14 sets of 5 repetitions at progressively increasing fractions of the maximum power output: in week 1 70% of Wmax, 90% of Wmax in week 4. Participants were provided a visual feedback using D.Soft, the D11 dedicated software, so that they were allowed to see and adjust in real-time their power output during the training sessions. Participants were allowed to rest for 30 seconds between sets. Analysis was carried out using Prism 6 Statistical Software (paired T-test), significance was set at 0.05.

RESULTS

At baseline Wpeak was 737.1±423.9 W (mean ± standard deviation). After 8 sessions over 4 weeks of high intensity intermittent isoinertial training Wpeak significantly (p=0.0003) increased from 737.1±423.9 W to 1063.7±459.8 W, mean of differences 486.9 W, 95% CI 299.4 to 674.4 W) and Wmax significantly (p=0.0010) increased from 521.2±297.3 W to 861.3±383.3 W, mean of differences 448 W, 95% CI 244.3 to 651.7.

DISCUSSION

Our results show that a 4-week low-volume (twice a week) isoinertial training programme performed at submaximal intensities (80% Wmax) is useful to enhance power output. Further research is needed to clarify the mechanisms of adaptation.

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INITIAL KAATSU CUFF TIGHTNESS: EFFECT OF LIMB ANTHROPOMETRICS ON BLOOD FLOW RESTRICTION

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INTRODUCTION

KAATSU training involveslow load (20%1RM) resistance exercisecombined withpartial blood flow restriction (BFR). BFR is achieved by positioning a specially designed pneumatic cuff around the proximal aspect of the limb, cinching it to aninitial cuff tightness (ICT),then inflating the cuff to a higher restrictive training pressure. ICTs can potentially impact the degree of BFR (%BFR) caused at the highertraining pressures,yet many studies use the same ICTs for all subjects(1).Identifyingthat discrepancies in %BFR existbetween subjects with different limb anthropometrics is an important step inmoving toward standardization of BFR dose for KAATSU training prescription.The purpose of this study was toidentifyvariation in %BFR between subjects experiencing the sameICT and what limb anthropometrics (circumference, muscle, and fat composition) may be determinants.

METHODS

Forty-two volunteers (26men, 16women) provided informed consent. Caliper skin folds, Gulick tape circumferences, and peripheral quantitative computed tomography (pQCT) scans were performed on the randomly assigned ipsilateral arm and leg at the level of the KAATSU cuff application. %BFR was measured via pulse-wave Doppler ultrasound at baseline (no cuff) andat an ICT of 30 mmHg. Variable relationships were assessed using Pearson correlations and stepwise linearregression.

RESULTS

Theaverage %BFR (avg±st. dev.) for the arm and legwas16.01±11.42% and16.75±9.27% with a range of 46.66% and 36.41%, respectively. The dependent variable for regression analysis was %BFR. In the arm, pQCT-determined muscle (R^2=.614)and fat composition(R^2=.587)were significant (p<.05)determinants of %BFR.Circumference was also a determinant (R^2=.163). There were no significant correlations between %BFR and the anthropometrics for the leg. pQCT fat composition and sum of skin folds correlated significantly (r=.915, p<.05). pQCTcircumference and Gulick circumference measures correlated significantly (r=.991, p<.05).

DISCUSSION

Conflicting BFR training results have been reported in the literature. A potential cause could be universal ICT usage causing some individuals to receive an inadequate training stimulus. Individuals using a 30 mmHg ICT will experience different%BFR when limb anthropometrics vary. Thus a method of assigning ICTs specific to individuals' anthropometric characteristics is needed to ensure equally potent stimuli.Skinfold measures and circumference measures were highly correlated with pQCT data.As a result, skinfold and Gulick circumference measures can be used topredict arm composition at the level of the cuff and may inform prescription of appropriate ICTs that result in more consistent initial %BFR across individuals.

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Poster

MUSCULAR ACTIVATION DURING PUSH-UPS PERFORMED UNDER DIFFERENT UNSTABLE CONDITIONS

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INTRODUCTION

Suspension devices for physical conditioning have increased the work possibilities of the professionals that use devices that generate instability (1). Suspension training devices seem to have the same possibilities as the rest of the unstable devices during the performance of global exercises, as for example the push-ups (2). However, there is no agreement in the current studies (3).

METHODS

To compare agonist muscular activationduringpush-ups performed in fivedifferentsunstableconditions, TRX suspensión training®, Wobbleboard (WBR), Stability Disc (SD), Fitness Dome (FD), and onestablecondition (CE). 30 physically fit and healthy subjects took part in the investigation. Muscular activation was evaluated in Triceps Brachii, Anterior Deltoid, Pectoralis, and Serratus Anterior during execution of 5repetitions of the push-up exercise at same height. Surface electromyography was recorded and the average root mean square values were calculated for each condition and muscular group. The conditions were counter-balanced. The maximum isometric voluntary contraction (MIVC) was evaluated for the normalization of the electromyographic signal. All values, expressed as the % MIVC, were compared using a multiple analysis of variance (MANOVA). Significance level was set at $p<0.05$.

RESULTS

Push-ups performed with TRX provoke similar muscular agonist activation, in all the muscles studied, than employing other unstable devices and/or stable conditions, except in the Pectoralis where the muscular activation was higher in TRX (76.70%) than in the Stability Disc (62.18%), ($p\leq0.05$). There were no differences between conditions (unstable and stable), except in the Serratus where the muscular activation was higher in unstable conditions ($p\leq0.05$).

DISCUSSION

The use of instabilitydevicesdoesnotincreaseactivation of theagonistmuscles, so we can recommendits use fromtheperspective of variety and motivation in training.

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HEART RATE VARIABILITY CHANGES ON VOLLEYBALL PLAYERS AFTER A COMPETITION

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INTRODUCTION

Actually, heart rate variability (HRV) has increased its use for being a noninvasive technique to measure the workload of athletes and its ability to adapt to extreme conditions both internal and external (1). Based on the sympathetic and parasympathetic activity, measured changes in autonomic functions due to exercise (2). The purpose was to analyze changes on HRV after a competition and its recovery.

METHODS

Nine players gave their consent (age: 22.8±3.2, weight 85.3±6.1, height 190.2±5.5) and took part of the study on a National University Competition, which was approved by the ethics committeeCOBICIS. HRV was recorded for 15 minutes in the supine position using Polar Team^2 (3). Values were analyzed by KUBIOS software through an analysis of time parameters (MRR, SDRR, rMSSD, pRR50). The scatter plot Poincare was analyzed by the transverse axis and the longitudinal axis SD1 SD2.The first record was resting one day before starting the competition, the second was at the end of the last match, the recovery was monitored at 2, 24 and 48 hours after the competition and the last record was a week later.

RESULTS

Through HRV we found a statistical significancebetween samples 2 and 3 belonging to the end of the competition and two hours later, this behavior is reflected in the MRR (p=0.000), SDNN (p=0.010), pNN50 (p=0.000), SD1 (p=0.001) and SD2 (p=0.014), unlike the rMSSD (p=0.070) which shows no statistical significance.

DISCUSSION

A decrease in the HRV was observed at the end of the competition and two hours later, assuming a predominance of sympathetic activity and decreased parasympathetic activity caused by the stress of consecutive games played without permit suitable recovery (3, 4, 5). These results allow us to understand the impact of competition on physical performance and determine performance status.

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Poster

PHYSIOLOGICAL RESPONSES DURING VALENCIAN BALL COMPETITION

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INTRODUCTION

Valencian ball is a very arranged traditional sport in the east coast of Spain. Nowadays the modernization process of the most practiced modality of this sport Escala i Corda is being developed, so most sciences and investigation works are coming to light. The play Escala i Corda is a divided pitch non-implement sport (1), that is practiced outdoor and indoor courts called Trinquets. There are two teams with their players opposited and separated by a rope with a little 10 cms net. Players have an alternative participation palming the ball, without pressing or physic contact with other players. Each team is composed by three players. There aren't studies that measure the physiological load in Valencian Ball. The objective of the study was to assess physiological load during Valencian Ball competition.

METHODS

6 Valencian Ball professional players (30. 8±7, 4 years; 24.5 ± 1.6 BMI), during 3 matches were analyzed. We measured their heart rate (Polar Team 2) and blood lactate concentration (Lactate Pro LT-1710) during competitions.

RESULTS

The mean (SD) heart rate and blood lactate concentration recorded during the matches were 165 (10) beats/min and 3.3 (0.2) mmol/litre. The values are different depending on the competition, the player and the position occupied in the field.

DISCUSSION

Resto is the back player. The lactate values are higher than the other players 3.3 (0.2) vs 2.1 (0.3) mmol/litre. Resto plays the ball insidedau and plays the most difficult skill, therebot (ball that rebounds on the rearwall). Mitger and Punter play similar skills. Both of them play in front of Resto.

The results are similar to other field divided sports as tennis (2). The physiological (ie, blood lactate and heart rate) responses associated with match play were influenced by the characteristics of the match and position of the players. Training programs should reflect these demands placed on players during competitive match play.

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SUPERVISED EXERCISE IMPROVES MATERNAL HEALTH PERCEPTION IN OVERWEIGHT/ OBESE PREGNANT WOMEN: A RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION

Pregnancy is the only vital process that involves modifications of almost all body systems. Some of these modificationsmay cause discomfort and reducequality of life during this period(1). Overweight/obese women have higher risk associated to this. We aimed the effectiveness of an exercise program performed during second and third trimesters of pregnancy on maternal health perception in women with pre-gestational BMI≥25.

METHODS

Collaboration between the Technical University of Madrid and the Gynaecology and Obstetrics Department of Puerta de Hierro University Hospital, Torrelodones University Hospital and Fuenlabrada University Hospital supported the study. It was approved by the Clinical Research Ethics Committee. All women gave their consent for inclusion in the study, in agreement with last modification of the Declaration of Helsinki (2). A total of 98 healthy pregnant women were randomly assigned to either a standard care or controlled exercise intervention group. Of these women, 82 were studied (age= 32.06±4.4 years), 35 in intervention group (IG, n= 35) and 47 in control group (CG, n= 47).The intervention program included moderate intensity aerobic and muscular conditioning exercises performed 3 times per week (50-60 minutes per session).Maternal health perception was calculatedbetween 36-38 weeks of gestation by SF-36 King's Health questionnaire (3).

RESULTS

The results showeddifferences between groups in maternal health perception [very good: IG 40.0 %, n= 14 vs. CG 17.0%, n= 8; good: IG 54.3%, n= 19vs. CG 34.0%, n=16; average: IG 5.7 %, n= 2 vs. CG 40.4%, n= 19; poor: IG 0.0 %, n= 0 vs. CG 6.4%, n= 3; very poor: IG 0.0 %, n= 0 vs. CG 2.1%, n= 1 (c^2_4= 18.29; p= 0.001)].

DISCUSSION

Exercise of moderate intensity performedover the second and third trimesters of pregnancy improvedmaternal health perception.Similar results were obtainedfromstudies performed on a sample of women irrespective of being normal-weight, overweight or obese (4).

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Poster

PERFORMANCE AND CONDITIONING DIFFERENCES IN YOUNG ELITE CANOEISTS RELATING TO MATURITY STATUS

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INTRODUCTION

Relative age and maturity status have an important implication in functional capacities and physical performance in young athletes (1). However, sport governing bodies continue promoting competitions where some categories include two years of chronological age that might be more in terms of biological age. Therefore, the aim of this study was to compare the on-water performance and conditioning characteristics relating to the maturity status in young elite canoeists.

METHODS

Twenty young elite sprint male canoeists (age: 15.7 ± 0.7 years-old) participated in this study. Stretch stature, body mass and sitting height were measured in order to determine the time to/from Age Peak Height Velocity (APHV) as an indicator of somatic maturity during adolescence, according to the Mirwald et al. (2) procedures. The sample was divided into two groups with regards to maturity status: less (group 1) and more than 2 years (group 2) from APHV. All the subjects performed the following tests: on-water 200-m and 500-m maximal tests; one repetition maximum (1RM) in bench press and prone bench pull exercises; 20-m shuttle run test (in order to obtain an estimation of maximal oxygen uptake); isometric side support in both right and left sides; and isometric endurance of trunk extensor muscles by means of Sörensen test. An independent t-test was conducted to examine differences between both groups for all dependent variables.

RESULTS

No significant differences were found in all the conditioning variables explored except for 1RM bench press (group 1 = 69.7 ± 9.5 kg; group 2 = 81.5 ± 10.5 kg; $p = 0.017$). Although no significant differences were found in on-water tests, group 2 was two and three seconds faster than group 1 in 200-m and 500-m, respectively.

Furthermore, group 2 had significant higher values in anthropometric variables: stretch stature (175.1 ± 5.1 Vs. 170.2 ± 2.7 cm; $p = 0.16$); body mass (73.8 ± 5.8 Vs 64.1 ± 4.3 kg; $p < 0.01$); sitting height (93.4 ± 3.0 Vs 89.3 ± 1.6 cm; $p < 0.01$); chronological age (15.9 ± 0.5 Vs. 15.4 ± 0.4 years-old; $p = 0.43$); and time from APHV (2.4 ± 0.3 Vs. 1.5 ± 0.2 years; $p < 0.01$).

DISCUSSION

Significant differences in 1RM bench press and basic anthropometric dimensions have been found between groups who compete in the same category but with a difference of 0.5 years in chronological age and 0.9 years in time from APHV. The findings of the current study were consistent with those of Mohamed et al. (3) who reported that maturation in young handball players was an important variable in anthropometric measures but not in physical performance.

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PROPORTIONALITY COMPARISON BETWEEN YOUNG ELITE MALE SPRINT AND SLALOM KAYAKERS

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INTRODUCTION

Morphological and proportionality characteristics of Olympic sprint and slalom paddlers have previously been studied (1, 2). But only one has pointed out the differences between both disciplines in young women kayakers (3). The aim of this study was to compare the proportionality characteristics between young male sprint and slalom kayakers.

METHODS

Sixty six young elite male sprint (n = 23; 13.69 ± 0.64 years old) and slalom (n = 23; 13.80 ± 0.55 years old) paddlers were measured using a complete battery of 26 anthropometric dimensions (4 basic measures, 7 girths, 7 breadths and 8 skinfolds). They were selected by the Royal Spanish Canoeing Federation as the best in their categories to participate in two consecutive Annual National Development Camps. Means, standard deviations and Z-scores were calculated for all variables using the Phantom Stratagem (4). An independent t-test was conducted to examine differences between groups.

RESULTS

Sprint paddlers had significant higher Z-scores in sitting height (sprint = -0.25 ± 0.40; slalom = -0.82 ± 0.76; $p < 0.05$), biiliocristal breadth (sprint = 0.12 ± 1.35; slalom = -1.51 ± 0.89; $p < 0.01$) and hip girth (sprint = -0.98 ± 0.87; slalom = -1.58 ± 0.69; $p < 0.05$). No significant differences were found in other variables.

DISCUSSION

Proportionality characteristics were similar in sprint and slalom disciplines. The differences were found in the sitting height and the dimensions of the pelvic area. These results differed from Alacid et al. (3) where slalom female paddlers possessed higher Z-scores in arm spam and biacromial, humerus and femur breadths. The differences between the young and word-class paddlers were similar in both sprint and slalom disciplines. As expected, the elite paddlers were proportionally larger in all measures except for the sum of skinfolds and femur breadth (1, 2).

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Poster

EFFECT OF PASSIVE STRETCHING OF THE ANTAGONIST MUSCLES RELATED TO THE NEURO-PROPRIOCEPTIVE AGONIST RESPONSE

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INTRODUCTION

Stretches have been considered at this stage to contribute to injury prevention and performance enhancement (1). In recent years there has been controversy about it, because previous stretching can impair the ability of the muscle to generate force (2). The aim of the study was to determine the effects of passive stretching exercise of an antagonist muscle on the ability of neuro - proprioceptive response of an agonist muscle in young adult subjects.

METHODS

10 healthy and experienced in training volunteers (3 female and 7 male)(24.7 ± 4.97 y) took part in the study. Perform 5 ' warm-up half intensity, 50-60 % HRmaxstationary or exercise bike, and 10 squats. Then the examiner, with over 3000h of experience, performs neuro-proprioceptive response test (NPR) to the straight hip flexoranterior quadriceps. If there is negative mechanical response, MAT ® is applied and the process is repeated until obtaining positive response to NPR. Then 15'' maintained passive stretch is applied to antagonist muscle.

RESULTS

60% of subjects tested negative NPR mechanical response after stretching. The quadriceps rectus has a mean electrical inferior value in the MCVI after stretching (180.5 ± 274.13 and 233.63 ± 143.86 μV, p = 0.049 respectively). Not so with the TFL (236.13 ± 68.12 and 223.63 ± 76.12 μV, p = 0.493 respectively). EMG values means in the NPR tests indicate somewhat higher readings after stretching the quadriceps rectus (115.4 ± 45.64 and 147.3 ± 87.28 μV, p = 0.107 respectively), and somewhat lower in the TFL (132.6 ± 71.73 and 129 μV± 58.21, p = 0.799 respectively). In both cases the difference was not significant.

DISCUSSION

This study suggests that passive stretch of antagonist muscles may adversely affect the neuro-proprioceptive response to their agonists. This could explain the reduction in the ability to generate forcethat previous studies have shown (1). However, the average electrical value recorded during the test is not representative of what happens in mechanical response to the NPR test, since no significant differences between the values of the positive response and negative response were found, results consistent with recent studies (3). To better understand this situation it may be necessary to assess the latency timing between the application of a resistance and the maximum electrical response.

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RATE OF PERCEIVED EXERTION AS A MEASURE OF CARDIOVASCULAR STRESS

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INTRODUCTION

Monitoring the cardiovascular stress is a useful but invasive tool for the strength and conditioning coaches. Perceived exertion scales are an inexpensive solution to quantify the internal load of a person who performs an exercise. Previous researchshowed the sensitivity of the OMNI (1) Scale to different fatiguing protocols. The aim of this study was to describe the relationship between the cardiovascular responses to a fatiguing protocol and the evolution of the perceived effort.

METHODS

Eleven healthy sport science students (20-24 years) enrolledin this study. Subjects performed 3 familiarization sessions and 2experimental sessions. The first one was conducted in order to calculate the time to failure (TTF) during an isometric knee extensor exercise at 50% of maximum voluntary contraction force. This time was used to establish the individual work-pause. Training consists in exert 4 repetitions of 80%TTF with 3 minutes of rest between attempts. Hemodynamic parameters were measured beat to beat (Task Force, CNSystems) before and during each repetition: Heart Rate (HR), systolic blood pressure (SBP), mean blood pressure (MBP). In addition, subjective central and peripheral perception of effort was also measured (OMNI Scale).

RESULTS

Significant correlations were found between central perceived effort (RPE-central) and changes in cardiovascular variables (SBP, MBP) with the Pearson correlation coefficient, showing moderate to strong association ($p=0.01$-0.03, $R=0.62$-0.72). Also, peripheral perceived effort (RPE-peripheral) have a significant ($p>0.02$, $R=0,71$) correlation with the maximum HR reached in every repetition.

DISCUSSION

Rate of perceived exertion scale stands as a helpful instrument to measure the cardiovascular stress. This study-expand previous results (2) andcould contribute to a better understanding of the physiological mechanisms underlying the perception of effort in the cardiovascular response to exercise.

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Poster

AGE DIFFERENCE ON COP REGULARITY IN SINGLE LEG QUITE STANCE

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INTRODUCTION

Various measures of entropy have been employed over the last years to quantify COP variability during quiet standing. In general, entropy provides information regarding the amount of irregularity, or randomness, in a time series, with low (high) values indicating more (less) regularity (1), helping us to better understand the inherent complexity of the postural control system. The purpose of the present experiment was to analyze if Sample Entropy (SampEn) it is a useful tool to discriminate between two groups of healthywomen of different ages in terms of COP dynamics.

METHODS

We analyzed COP dynamics during 30s in healthy young girls (YG: n=24; 9.6 ± 1,1 years, 140,5 ± 6.8 cm, 37.7 ± 7.6kg) and middle-aged women (MAW: n=21; 46.6 ± 5.9 years, 167,1 ± 6.1 cm, 63.4 ± 7.9 kg) while they performed unipedal (dominant – DL - and non-dominant leg - NDL) quiet standing test on a force platform (MuscleLab TM system, type PFMA 4000e, a collection rate of 100Hz). SampEn were calculate (custom Matlab™ routine) from the anterior-posterior (AP) and medial-lateral (ML) COP time series. Distribution testing for normality was done using the Shapiro-Wilk test and a 2 x 2 mixed-design analysis of variance (experimental group x leg) was used to compare outcome measures.

RESULTS

The results obtained in the study subjects have shown significant difference ($p<0.05$) and the analysis of variance presented a main effect for age groups for the SampEn_AP ($F_{1,43}=14.3$, $p<0.05$) for both legs[YG: DL 0.21 ± 0.06; NDL: 0.22 ± 0.07 and MAW: DL 0.16 ± 0.05; NDL: 0.16 ± 0.05], resulting from an increased values for the young girls group compared to the middle age women. However, significant differences were not found for SampEn_ML for the age group neither for the dominance leg factor [YG: DL 0.25 ± 0.09; NDL: 0.24±0.09 and MAW: DL 0.22 ± 0.07; NDL: 0.21 ± 0.06].

DISCUSSION

Ourresults suggest that the SampEn can be a useful tool to discriminate women of different ages. The increased complexity of sway showed by youngers (YG) can indicate a more automatic and less restrict postural control, with more efficient sways that characterize a healthier system (2).

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ELASTIC TUBING AND FREE WEIGHTS ACHIEVED COMPARABLE IMPROVEMENTS IN PRE AND POST-MENOPAUSAL WOMEN

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INTRODUCTION

Menopause is associated with a loss of muscle strength and physical fitness (1). The implementation of exercise programs that prioritize strength training may reverse or reduce these declinations, improving the quality of life (1). However, the effectiveness of alternative, portable and accessible devices as elastic tubing resistancestill remains poorly investigated in comparison with the use of traditional resistance training, especially in this population (2).

METHODS

A randomized control trial design with a sample of 62 adult women was employed. Subjects took part in a 12-week program and were divided in three groups: Group 1 (G1=22), elastic tubing on the Thera-Band Exercise Station; Group 2 (G2=20), free weights; Group 3 (G3=20), control. Timed Up and Go (TUG) test, Prone Bridge Test (PBT), Six-minute walking test (6MWT), and Upright Row(UR) were analyzed pre and post intervention to evaluate training effects. The program consisted of 10 exercises. First and second month 3 laps with 15 repetitions (OMNI-RES 7-8) were performed and 4 laps with 10 repetitions (OMNI-RES 9) in the third month (3). All parameters were analyzed with the respective statistical treatment.

RESULTS

G1 showed a significant intragroup improvement ($p \leq 0.05$) in TUG (-9,26%), PBT (+ 74,47%), 6MWT (+ 7,77%), UR (+ 38,96%). G2 showed a significant intragroup improvement ($p \leq 0.05$) in6MWT (+ 6,59%), UR(+ 31,42%) and PBT (+ 120,64%). No significant differences were found between G1 and G2 and both showed improvements than G3. However, G3 showed no significant intragroup improvements ($p > 0.05$).

DISCUSSION

The performance of an elastic tubing-based exercise program showed their effectiveness to achieve similar short-term improvements on the physical performance as traditional free weights in sedentary and adult women, according to previous elastic-resisted programs with healthy, physically active subjects (2) and sedentary middle-aged women (4). Present data provides additional scientific evidence supporting the use of elastic-resisted exercise programs as an alternative to traditional free weights in pre and post-menopausal women.

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Poster

EFFECT OF A SPORT EDUCATION SEASON ON SOME PSYCHOLOGICAL VARIABLES IN YOUTH SWIMMING

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INTRODUCTION

In the school setting, the effectiveness of the teaching and learning process is being a research "hot-topic". Howeverin the sport contextactually is not a research interest, not a lot of studies have the purpose to analyze the effect of teaching models on performance. A large number of investigations reflect the relationship between psychological state and performance, the model may be applied a flattering teaching tool for this situation. Sport Education (SE) is a pedagogical model applied moreon team sports (more tactical). Howeverthere arenot studies that focus ontheindividualsports (more technical). Therefore, the purpose was to analyze the effect of SEseason on psychological variables in youthswimming.

METHODS

A quasi-experimental design was performed with pre-post measures, applied in youth swimmers (n=24) of different categories, with a trainingprogram of 16 sessions. The questionnaires used were: Perceived Autonomy Support (Conde et al., 2010), Sport Commitment (Belando, Ferriz-Morel, and Moreno-Murcia, 2012), and Enjoyment and Perceived Competence (Arias, Alonso and Yuste, 2013).Were statistically analyzed using Wilcoxon Ranks and Spearman Rho.

RESULTS

The intervention program based on the SE caused statistically significant improvements from pre to post(p=0.00*) on the variables and their indicators: (A)Perceived autonomy (autonomous behaviour and athlete review); (B)Sport commitment (present and future commitment); and (C) Level of Experience and Perceived Competence. Furthermore, appreciated that the variables are positively correlated with each other (A&B: r=0.40*;A&C:r=0.37*; B&C: r=0.22*).

DISCUSSION AND CONCLUSION

The results of this study corroborated the positive effect of the Sport Education on the psychological variables (Hastie, Martínez de Ojeda, y Calderón, 2011) also in the sport context. Sport Education could be an alternative to other teaching models to develop the excellence, in sports that focus on technical execution (such as swimming).So it should be applied indifferentsports clubs to improve the learning experience engagement of youth swimmers in the sport context.

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ASSOCIATIONS OF PHYSICAL FITNESS WITH ILLNESS PERCEPTION IN WOMEN WITH FIBROMYALGIA: THE AL-ÁNDALUS PROJECT

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INTRODUCTION

Fibromyalgia is a syndrome characterized by the presence of chronic widespread musculoskeletal pain (1). Physical performance and functionality are decreased on fibromyalgia patients, above all on women (2). The guidelines for the management of fibromyalgia developed by the European League Against Rheumatism (EULAR) recommend multidisciplinary interventions that include physical exercise as a fibromyalgia treatment (3). The aim of the present study was to assess the associations of physical fitness with illness perception in women with fibromyalgia.

METHODS

One hundred and seven women with fibromyalgia (mean age: 54.25 years, standard deviation: 7.02) were recruited. We assessed illness perception by seven domains of Illness Perception Questionnaire-Revisited (IPQ-R) (timeline acute/chronic, timeline cyclical, consequences, personal control, treatment control, illness coherence and emotional representations) and physical fitness by means of the 30-second chair stand, arm curl test, chair sit and reach, back scratch and 6-minute walk tests. The association of physical fitness with different domains of the IPQ-R was assessed with Tau b of Kendall.

RESULTS

The *identity* and *time cyclical* domains were not significantly associated to physical fitness. We observed an association of 6-minute walk test with *treatment control* (Kendall´s tau b=0.151, P=0.029), arm curl test with *consequences, treatment control* and *emotional representation* (Kendall´s tau b = -0.237, P=0.001; Kendall´s tau b =0.163, P=0.020; Kendall´s tau b=-0.138, P=0.47, respectively), 30-second chair stand with *consequences, personal control* and *treatment control* (Kendall´s tau b=-0.188, P=0.008; Kendall´s tau b=0.177, P=0.009; Kendall´s tau b=0.152, P=0.034, respectively), back scratch with *timeline, treatment control, illness coherence* and *emotional representation* (Kendall´s tau b=-0.137, P=0.45; Kendall´s tau b=0.222, P=0.001; Kendall´s tau b=0.203, P=0.003; Kendall´s tau b=-0.234, P=0.001, respectively) and chair sit and reach with *treatment control* (Kendall´s tau b=0.190, P=0.006).

DISCUSSION

Our findings indicate there is an inverse association of physical fitness with views of the illness and perception of negative emotions generated by fibromyalgia while there is a positive association with better personal understanding and controllability of the fibromyalgia. These results suggest that enhancing physical fitness might be a reasonable strategy to improve the perception of illness in women with fibromyalgia. Further research is required to better understand the association of physical fitness and illness perception in fibromyalgia patients.

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Poster

TIME COURSE OF POST-ACTIVATION POTENTIATION AFTER A SUSTAINED MAXIMAL VOLUNTARY CONTRACTION

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INTRODUCTION

The post-activation potentiation (PAP) is defined as an increase in muscle performance after the completion of a contraction or conditioning activity (Belanger et al., 1983). The PAP is really clear and reliable after conducting a short (5 seconds) maximum voluntary contraction (MVC) (Vandervoort et al., 1983).

This phenomenon is critical for athletic performance, however the concurrence of the PAP with muscle fatigue difficult its study. For this reason, the aim of the present study is to investigate the time course of PAP after performing a sustained MVC in the knee extensor muscles until fatigue.

METHODS

For this purpose, we evaluated 9 healthy well trained subjects, who performed sustained isometric MVC (90 °) until the loss of ± 50% of peak initial torque. In order to assess the PAP on the knee extensor muscles, supramaximal electrical stimulation of the femoral nerve was applied before and after a brief (5´´) MVC, and the amplitude and the rate of force development (RFD) of the resting twitch (RT) were obtained.

This PAP protocol was carried out before and 0'30'' 1'30'' 2'30'' 3'30'' 5 'after the completion of the sustained MVC (fatigue protocol). PAP was expressed as the increase in the RT amplitude and RFD just after the 5´´ MVC. In order to determine the effects of the fatigue protocol on PAP, repeated measures (RM) ANOVA was performed. The alpha level was set at $p \leq 0.05$.

RESULTS

Statistical analysis showed a significant decrease ($p<0.05$) in the PAP because twitch amplitude and RFD potentiation were significantly reduced immediately after (0´30´´) the performance of the sustained contraction until fatigue. However, PAP was recovered with the performance of a new brief contraction (1´30´´) since no differences were found related to the baseline.

DISCUSSION

It is evident that after a sustained MVC until fatigue, both PAP and fatigue coexist. Although many factors can affect the level of twitch potentiation, it seems that the regulatory light chain phosphorylation is directly related to the twitch potentiation (Moore & Stull, 1983). In this sense, the rapid change in PAP just after the fatigue protocol showed in the present study could be related to the phosphate content. However, it could be also related to the neural factors, such as the excitability of the alpha-motoneurones (Folland et al., 2008).

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Poster

TIME COURSE OF PERIPHERAL AND CENTRAL FATIGUE AFTER A SUSTAINED MAXIMAL VOLUNTARY CONTRACTION IN THE KNEE EXTENSOR MUSCLES

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INTRODUCTION

It is well known the concurrence of peripheral and central fatigue after a sustained maximum voluntary contraction (MVC) (Taylor et al., 1996, 1999). However, the time course of both types of fatigue, peripheral and central, after such contractions is not well studied in the knee extensor muscles.

Therefore, the aim of this study is to investigate the time course of both types of fatigue, central and peripheral, following a sustained MVC until fatigue in the knee extensor muscles.

METHODS

For this purpose, we evaluated 9 healthy well trained subjects, who performed sustained isometric MVC (90 °) until the loss of ± 50% of peak initial torque. Using the twitch interpolation technique, peak isometric torque (MVC), voluntary activation (VA%) and the resting twitch (RT) amplitude were assessed before, and 0'30'', 1'30'', 2'30'', 3'30' and' 5' after the completion of a sustained MVC, in order to know the contribution of the central (VA) and peripheral (resting twitch) factors to the muscle fatigue (loss of MVC). The statistical inference was carried out thought a repeated measures ANOVA (RM-ANOVA) for the abovementioned variables. The alpha level was set at $p \leq 0.05$.

RESULTS

The mean time of the sustained MVC was 44.9 (±11.5) seconds, and the mean torque immediately before the task failure was 55.4% (±9.8) of the initial MVC torque. The RM-ANOVA showed a significant decrease ($p < 0.05$) in MVC and VA (%) until 3'30'' after the sustained MVC. However, the resting twitch amplitude only decreased significantly ($p < 0.05$) until 1´30´´. The shift between the recovery of VA and RT shows a different contribution of both central and peripheral factors to the knee extensor fatigue.

DISCUSSION

Present study showed how immediately after a sustained MVC of the knee extensor muscles co-exist both mechanisms of central and peripheral fatigue. This is evident since it was reduced the VA and the RT during 1'30'' after the sustained MVC. This is in accordance with previous results from Bigland-Ritchie et al. (1978). However, a different recovery pattern of the central and peripheral factors was revealed. Despite that the contractile properties of the knee extensor muscles failed by 1´30´´, the central fatigue lasted for at least 3´30´´. This data must be taking into account for programming some high intensity training activities.

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Poster

CHANGES IN THE MECHANICAL CHARACTERISTICS OF THE KNEE MUSCULATURE IN PROFESSIONAL FEMALE VOLLEYBALL PLAYERS

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INTRODUCTION

The technical efficiency in volleyball is closely related to the ability to perform displacements or jump (1). Therefore, it is necessary that precise, individualized, and localized evaluation of the muscles frequently involved in volleyball practice be studied (2,3).The aim of this study was to analyze the neuromuscular changes of the knee musculature in professional volleyball players using Tensiomyography (TMG) and jump tests.

METHODS

A total of 16 professional female volleyball players (age: 20.32±1.68; body weight: 67.75± 9.13; height: 178.26± 7.12; BMI: 21.41± 1.75) from two Spanish Superleague teams were studied. VastusMedialis (VM), RectusFemoris (RF), VastusLateralis (VL) and Biceps Femoris (BF) were assessed using TMG. Maximal radial deformation (Dm), delay time (Td), and contraction time (Tc) were obtained for each muscle before the competitive season and four months after a training program (programed point of optimal physical condition).In addition, Squat Jump (SJ) and Countermovement Jump (CMJ),were assessed using a contact platform. RESULTS: Results showed changes (Δ%) in both lower: Δ%Dm right [VL =-23.19 ($p \leq 0.05$), VM=-5.66, RF=-13.16, BF=-11.78], Δ%Dm left [VL =-23.02 ($p \leq 0.05$), VM=1.30, RF=5.58, BF=-25.82 ($p \leq 0.05$)], Δ%Tc right [VL =-12.21 ($p \leq 0.001$), VM=1.99, RF=-10.54, BF=-2.03], Δ%Tc left [VL =-4.11, VM=-6.07, RF=-11.93 ($p \leq 0.05$), BF=-4.04], Δ%Td right [VL =-8.22 ($p \leq 0.05$), VM=0.38, RF=-2.73, BF=-2.10], Δ%Td left [VL =-4.67, VM=-0.97, RF=1.03, BF=-7.54].Jump height reached after 4 months of training was significantly greater in all tests [SJ ($p \leq 0,011$) y CMJ ($p \leq 0,001$)].

DISCUSSION

TMG results shown that adaptations to training are achieved differently on every muscle assessed (2). Moreover, those results reinforce the role of TMG as an equipment enough sensitive to detect changes produced by training in professional volleyball players (3). Gains in jump height support these results as they weredetected after applying the trainingprogram (1).

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DECREASEMENT ON METABOLIC RISK BIOMARKERS WITH A RESISTANCE TRAINING PROGRAM USING ELASTIC TUBING

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INTRODUCTION

Physiologic alterations during pre and post-menopausal ages decrease life quality. Resistance training programs demonstrated their effectiveness to improve cardiovascular parameters.

However, the effectiveness of alternative and portable devices as elastic tubing during exercise interventions still remains poorly investigated in comparison with the use of traditional resistance training (1-3).

METHODS

The aim was to evaluate the effects on the cardiovascular risk caused by strength training with different types of devices in women 40 to 50 years with low metabolic risk.Sixty-two women took part in a randomized design. Subjects were divided in three groups: Group 1 (G1=22), elastic tubing on the Thera-Band exercise station; Group 2 (G2=20), free weights; Group 3 (G3=20), control. C-reactive protein (CRP), glycosylated hemoglobin (HbA1c), low-density lipoprotein (LDL) and total cholesterol (TC) were used to assess cardiovascular health. The program consisted of 10 exercises organized in a circuit. During the first and second month, 3 laps with 15 repetitions (OMNI-RES 7-8) (2) per exercise were performed, 4 laps with 10 repetitions (OMNI-RES 9) per exercise were performed in the third month. Recovery from exercise was 30 seconds and 60 seconds between sets.All parameters were analyzed pre and post intervention with the respective statistical treatment later.

RESULTS

In a positive way,G1 significantly improved ($p \leq 0,05$) their baseline CRP (-33, 96%), HbA1c (-6,74%) and LDL (-9,9%) values and also tended to improve their TC levels. In addition, G1 showed greater CRP values than the control group. Control group worsened significantly the HbA1c (+3,49%). G2 improved their HbA1c (-3,03%) values. However, there were no differences between both intervention groups.

DISCUSSION

A 12-week elastic tubing-based program showed their effectiveness to achieve similar improvements as the traditional free weights intervention in sedentary pre and post-menopausal women. Our results are in accordance with previous studies that showed comparable improvements during elastic andfree weight exercises (1) orweight machines (3). Thus, elastic tubing may be used as an alternative to traditional resistance training in order to improve cardiometabolic health.

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Poster

NORMALIZED RESPONSE SPEED AND JUMPING-RELATED TECHNIQUES AFTER TRAINING IN FEMALE VOLLEYBALL PLAYERS

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INTRODUCTION

The true effectiveness in volleyball is related to the ability to perform quick displacements and jumping-related techniques (1). The monitoring of the muscular response has been related to functional capacity of the knee flexor and extensor muscles in other population (2, 3). It is of utmost importance to the study the muscular structures that enhance volleyball performance (2). The aim of this study was to analyze the responses of the normalized response speed and jumping-related techniques in a group of professional female volleyball players.

METHODS

A total of 16 professional female volleyball players were assessed (age: 20.32 ± 1.68; body weight: 67.75 ± 9.13; height: 178.26 ± 7.12; BMI: 21.41 ± 1.75) from two Spanish Superleague teams. Normalized respose speed (Vrn) was measured using the Tensiomyography (TMG) on Vastus Medialis (VM), Rectus Femoris (RF), Vastus Lateralis (VL), Biceps Femoris (BF) y Semitendinous (ST) previous to the season and after 4 months of training and physical conditioning. Abalakov jump test including volleyball specific arm movement (BLQ) and three steps approach-attack jump (ATT) were also assessed using a contact platform.

RESULTS

The Vrn resulted improved for all the muscles except VM in both limbs were Vrn was maintained, but only Vrn results shown significant improvements on VL ($p \leq 0{,}001$). Height reached after training was significantly greater in both jump test BLQ ($p \leq 0{,}05$) y ATT ($p \leq 0{,}001$).

DISCUSSION

Height gains support that the training and physical conditioning (adaptation, hypertrophy, maximal strength and transfer) results in an improved jumping-related techniques (1). TMG-related results also show that there are mechanical adaptations in VL that are related to the requirements of volleyball (2). Moreover, the results obtained on VM in females reinforce the important role of these muscles in the stabilization of the knee joint during jumping-related techniques (4).

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PERFORMANCE OF MUSCULAR POWER PROFILE AFTER A TRAINING CAMP AT MODERATE NATURAL ALTITUDE IN YOUNG SWIMMERS

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INTRODUCTION

Chronic hypoxia has frequently been associated to the loss of muscle mass and its functional capacity (1). However, most of these studies were conducted at higher altitude (> 5000m) than that at which athletes usually train (2000-3000m asl). Surprisingly, although acute ascent to moderate altitude seems to improve performance on explosive actions (2), there is a lack of longitudinal studies analysing the effects of altitude training on explosive muscle performance. In this context, the main objective of this study is to examine the behaviour of lower limb muscular-power profile after a 15-day training camp at moderate natural altitude.

METHODS

18 young male swimmers, from the Junior Spanish National team (age: 16.7±0.8 years) lived and trained during 2 weeks at CAR of Sierra Nevada (2320m asl). During two consecutive weeks all pool and dryland training sessions were monitored. All subjects were tested at the beginning and at the end of the altitude camp in normoxia (N_1 and N_2) and hypoxia (H_1 and H_2). Load-velocity relationship was estimated in only-concentric jump squat in a Smith Machine (knee angle of 90º) at the corresponding loads 25%, 50%, 75% and 100% of body weight (bw). A linear velocity transducer (T-Force, Murcia, Spain) was used.

RESULTS

Swimmers performed 25 pool sessions (mean of 119.8±10.8 min of duration; 6696.0±644.2 m of distance swam and 7.3±0.9 of CR-10 session RPE (3)), and 10 dryland sessions (4 circuits training and 6 strength-power training). V_{peak} in H was higher in all percentages of bw in both acute (N1 vs H1 [$m \cdot s^{-1}$]; 25% (2.45±0.17vs2.57±0.16); 50% (2.08±0.17vs 2.23±0.13); 75% (1.84±0.13vs1.98±0.13) & 100%(1.9±0.11vs1.73±0.11) of bw; p<.01) and chronic altitude (N2 vs H2 [$m \cdot s^{-1}$]; 25% (2.52±0.12vs2.6±0.15); 50% (2.18±0.14 vs 2.27±0.15); 75% (1.89±0.13vs1.99±0.12) & 100%(1.60±0.11vs1.73±0.11) of bw; p<.01). Likewise, relative peak power (P_{peak}, $W \cdot bw^{-1}$) also increased significantly (p<.001). Differences in P_{peak} between N1-N2 were similar to H1-H2 in all cases, while Vpeak displayed slightly higher in N to 75% (p=.048) & 100% (p=.07) of bw, but with a medium effect size (-.46 and -.42 respectively).

DISCUSSION

This is the first study to demonstrate that improvements in jump performance at altitude are maintained after a chronic stay at real moderate altitude. Our results also display an average improvement of muscular P_{peak} and V_{peak} of 7.8 and 4.4 % respectively, after 2 weeks of training at moderate altitude, despite a reduction in bw (2.0±0.84 kg; p<.001). This observation suggests a diferent muscle power behaviour than observed after high-altitude exposures (> 5000m asl) (4). From the avobe, we propose that altitude training also could assume a favourable stimulus in muscle power development.

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Poster

UPHILL VERSUS SPEED CHUTE TRAINING: EFFECTS ON MAXIMUM RUNNING SPEED AND RACE PERFORMANCE IN MILITARY CADETS

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INTRODUCTION

Many different sprint training programs, including sprint-resisted methods, have been used with the aim of improving maximal sprint running performance (1). Sprinting up inclined surfaces and sprinting with speed chutes are two of the most popular sprint-resisted training methods. There are limited evidences to suggest an optimal speed resisted method for the enhancement of sprint running performance. Sprint training for 6 weeks on 3° uphill slopes did not improve maximum running speed and the related parameters (1). The present study investigated the effects of two speed resistance methods for improving sprinting performance.

METHODS

Eighty one cadets (matched for the 40m time) were randomly divided into three equal groups (n=27): the first group was training on a 3° uphill slope, the second on the horizontal and the third was training using a speed chute. The training program was carried out 3 days per week for a period of 7 weeks and involved eight sprint-runs over 40 m distances with a 5 minute interval on an indoor track. Maximal running speed was recorded on the 40m distance using digital video analysis (Paradisis et al., 2006). Eating, sleeping and activity conditions were fully controlled throughout the study.

RESULTS

There was a significant (ANOVA; $P<0.05$), increase in 40m race time across all groups (0.17 s; 1.4%, 0.31 s; 2.6% and 0.54 s; 5% for the horizontal, uphill and speed chute group respectively). A significant group by condition interaction ($P<0.05$) was also shown, indicating a greater performance potentiation in the speed chute group. Uphill group increased maximum running speed significantly with training by 1.4% (from 8.24±0.63 to 8.36±0.54 m s^{-1} ($P<0.05$) whilst, the speed chute group increased maximum running speed significantly by 3% (from 8.33 ±0.70 to 8.58±0.66 m s^{-1} ($P<0.01$). Horizontal group did not show any significant changes in maximum running speed with training.

DISCUSSION

The present findings indicate that to obtain short-distance sprinting improvement in a short period of time, one may prefer speed chute sprinting over other training forms. The present study provides evidence, in the form of kinematic data, that sprint training with speed chute produced significant increases in maximum running velocity and time in 40 m compared to uphill and horizontal sprint training. In conclusion, it can be suggested that the speed chute. Additionally, as the correlation between maximum running speed and performance is very high (r 0.90) in 100 m races (2), we could speculate that speed chute training method is more effective in improving performance in 100 m.

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THE EFFECTS OF DIFFERENT SIZES OF SPEED CHUTE TRAINING ON MILITARY RECRUITS' SPRINTING ABILITIES

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INTRODUCTION

There are many different sprint training programs such as sprint-resisted methods which have been used with the aim of improving maximal sprint running performance (1). In strength-specific exercises the athlete uses the sport movement with an added resistance, such as a speed chute. However, little is known about the extent to which the principle of speed specificity applies to all forms of speed chute training. This study examined the efficacy of three different speed chute loadings in relation to maximum running speed.

METHODS

A total number of forty eight cadets were randomly assigned into four equal (n=12) groups. The first, second and third group followed a training programme which involved eight times a 40m sprint using a medium, a large and two medium sized speed chutes respectively. The fourth group followed the same training programme entirely performing flat sprint running.

The rest interval between the runs was 5 minutes and thetrainingperiod lasted 7 weeks. In all cadets maximum running speed was measured via three maximal 40 m trials under flat and resisted conditions (groups 1, 2 and 3) pre, during (1st week) and post (8th week) the training programme, using a video camera.

RESULTS

A significantly decreased in maximum running speed was evident with the use of speed chute (pre versus 1st week; $P<0.05$) for the medium, large and two medium size (8.42 ± 0.35 versus 8.02 ± 0.42 $m.s^{-1}$, 8.52 ± 0.35 versus 7.92 ± 0.42 $m.s^{-1}$, and 8.52 ± 0.35 versus 7.72 ± 0.42 $m.s^{-1}$respectively). However, group 3 presented a significantly higher decline in maximum running speed compared to the other two sizes. Additionally, group 3 alongside with group 4 showed no significant change in maximum running speed following the 7 week training programme indicating no benefits in maximal speed phase but only in the acceleration phase via increases in step length (2.15 ± 0.29 to 2.31 ± 0.26 m; $P<0.05$).

DISCUSSION

A medium size speed chute offers the ideal resistive load leading to improvements acceleration phase and maximal speed phase and consequently to the highest performance potentiation in sprinting compared to other loadings and the traditional flat training.

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Poster

RELATIONSHIP OF PULL-UP REPETITIONS TO MAXIMAL AND RELATIVE LAT-PULL STRENGTH IN TRAINED ATHLETES

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INTRODUCTION

Two of the most common exercises used to strengthen the muscles in the shoulder region are the latissimus dorsi pull (lat-pull) and the pull-up. The purpose of this study was to determinate the relationships between lat-pull and pull-up exercises to both relative lat-pull and pull-up performance to body mass in a group of trained athletes in both exercises. A second purpose was to determine the effect of various anthropometric dimensions on each exercise.

METHODS

Twenty five firefighters or policeman candidates volunteered to take part in this study.

All subjects were evaluated for their ability to perform a maximum number of free-hanging pull-ups, 1RM lat-pull and lat-pull repetitions at body mass (lat-pull reps BM). Anthropometric dimensions included lean body mass (LBM), muscular mass (MM), and fat mass (FM) estimated from skinfolds measurements.

RESULTS

Pull-ups were significantly related to lat-pull reps BM ($r=0.62$, $p<0.01$). 3 anthropometric dimensions (BM, LBM and MM) were significantly related to pull-up performance ($r=-0.55$, $p<0.01$; $r=-0.50$, $p<0.05$; $r=-0.51$, $p<0.01$; respectively), to 1RM lat-pull ($r=0.55$, $p<0.01$; $r=0.55$, $p<0.01$; $r=0.54$, $p<0.05$, respectively) and to lat-pull reps BM ($r=-0.61$, $p<0.01$; $r=-0.57$, $p<0.01$; $r=-0.56$, $p<0.01$).

DISCUSSION

In the current study, we found a moderate correlation between pull-ups and lat-pull reps BM. However, a lack of relationship was observed between pull-ups and 1RM lat-pull. Similar results were observed by Doug et al (2) and Kristin et al (1). The latter research suggests that the lack of association might be partially explained by the manner in which the lat-pulls repetition test was conducted. 1RM lat-pull can be considered as an indicator of maximum strength whiles the pull-up repetitions as an indicator of relative strength to body weight. These results suggest that, when we compared similar indicators of strength, both exercises seems to have common elements. In our study, we have found a correlation between anthropometric dimensions and, pull-ups repetitions, 1RM lat-pull and, lat-pull reps BM, however, these relationships have different signs. Similar results to ours were observed by Kristin et al (1) and Doug el al (2). These results suggest that body composition seems to play an important role in the performances of these exercises; however, it appears to affect the performance differently according to the strength indicator evaluated.

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RELATIONSHIPS BETWEEN JUMP, STRENGTH, AND SPRINT IN 800 METERS MALE ATHLETES OF NATIONAL AND INTERNATIONAL LEVEL

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INTRODUCTION

Research has demonstrated a clear relationship between strength, sprint and jump performance in athletes(1-3). The aim of this study, therefore, was to determine the relationships between strength, sprint, and jump performances in 800 meters male athletes of national and international level.

METHODS

Seventeen male athletes (age: 22.29 years ± 4.95; height: 175.18 ± 5.47 cm; weight: 62.69 ± 4.61 kg) of national and international level in 800 meters (with personal bestranging from 1:43 to 1:58) participated in this study. Theathletes performed sprint tests (20m and 200m), countermovement jump (CMJ), jump squat (JS), and full squat test (SQ).

RESULTS

CMJ height showed a significant correlation with times in 10m (r:-0.632, $p<0.01$), 20m (r:-0.723, $p<0.01$), 10-20m (r:-0.705, $p<0.01$) and 200m (r:-0.515, $p<0.05$). JSwith the load that subjects could jump 20 cm height, showed a significant correlation with times in 10m (r:-0.675, $p<0.01$), 20m (r:-0.761, $p<0.01$), 10-20m (r:-0.739, $p<0.01$) and 200m (r:-0.573, $p<0.05$). SQ with the load that subjects were able to reach 1 m/s velocity, showed a significant correlation with times in 10m (r:-0.570, $p<0.05$), 20m (r:-0.658, $p<0.01$), and 10-20m (r:-0.658, $p<0.01$), but not in 200m (r:-0.459).

DISCUSSION

The results of this study showed strong correlations between CMJ, JS, strength in SQ, and 20m and 200m sprint times. The correlation of the strength and jump variables with time in 20m tended to be higher to that obtained in 10m, 10-20m, and 200m sprint times. The correlation with time in 200m was the smallest in all cases. Cronin et al. (2005) showed correlations between JS and CMJ height and sprint times in 5m, 10m (strongest correlation), and 30m,but not between 3RM squat and the sprint times in rugby players.Comfort et al. (2014) showed correlation between absolute and relative strength in 1RMsquat and 5m and 20m sprint times in soccer players.The results of the mentioned studies follow the same line of research as those of our study in relation with jumps, but differ with respect to maximal strength of lower-body. The results of this study illustrate the strong correlations between strength, sprint, and jump performances in 800 meters high-level male athletes.

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Poster

SOCCER SPRINT AND AGILITY ARE SIMILAR BETWEEN PRE- AND POSTPUBESCENT BOYS, WHEN BALL IS CONSIDERED

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INTRODUCTION

Scientific evidence suggests that specific physiological demands and anthropometrical prerequisites result in the selection of young players based onenhanced physiological performances and anthropometricaladvantage (1). However, the competitive demands are not the same in youth categories, inducing different physical and physiological profiles from those of adult players (2). The purpose of the present study was to analyze possible differences in speed, agility and jump height of pre- and postpubescent soccer players.

METHODS

Thirty-two boys, divided in pre- and postpubescent groups (GR1: n=16; Tanner stage = 2; age 11.1±0.3years; body mass 38.9±3.5kg vs. GR2: n=16; Tanner stage = 4; age 14.4±0.5 years; body mass 63.4±8.6kg), took part in across sectional study design.

Shortest time in a 20-m sprint (with and without the ball), shortest time in a 20-m agility test (with and without the ball), and maximum height in countermovement jump were assessed for each participant. Ball influence in sprint and agility test was estimated by the differential of time percentage. Means were compared with independent samples *t* test and Cohen's *d* was used for all comparisons to assess the difference effectsize.

RESULTS

Postpubescent boys were faster in both the sprint (with ball:3.9±0.2 vs. 4.2±0.2s, $p<0.001$, $d=1.40$; without ball: 3.5±0.2 vs. 3.8±0.2s, $p=0.001$,$d=1.34$) and the agility test (with ball: 8.3±0.4 vs. 8.7±0.4s, $p=0.011$, $d=0.95$; without ball: 6.9±0.2 vs. 7.2±0.6s, $p=0.008$,$d=1.01$), and jumped higher (34.1±3.7 vs. 29.4±4.6cm, $p=0.004$, $d=1.11$) than the prepubescentcohort. No statistical differences were observed in the differential of time percentage ($p = 0.913$ for sprint and $p = 0.877$ for the agility test), being slower when ball is included (sprint: -9.1±3.8%, $p< 0.001$, $d = 1.51$; agility test: -17.9±4.2%, $p< 0.001$, $d = 3.83$).

DISCUSSION

The number of studies evaluating prepubescent soccer players is scarce (2). Nevertheless, understanding the changes induced by the maturation process, may lead to a more appropriate training prescription. As hypothesized, the postpubescent boys were faster, more agile and jumped higher. However, the relative values presented very high similarities between groups (i.e. both groups were equally slower when ball was included in the tests). Despite a physical test is not sensitive enough to predict on-field performance (1), evaluations of relative skill processes (e.g. sprinting with or without ball) may give new insights for the training prescription at these ages.

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ANALYSIS OF FOUR DIFFERENT RESISTANCE TRAINING METHODS: ACUTE FATIGUE, COMPARISON AND CLASSIFICATION

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INTRODUCTION

Muscular hypertrophy has been defined as an increase in cross sectional area (CSA) followed by strength training.

It has shown a positive association with sport performance, quality of life and preventing diseases in the elderly (1). Several resistancetraining methods lead an increase in muscle size (2), however it is not still well known what methodology entail a higher acute fatigue to the organism.

Therefore, the purpose of the present study was to quantify acute fatigue afterstrength session with four different methodologies.

METHODS

Nine healthy men with at least two years of experience in strength training attended6 days to the installations. All subjects completed an informed consent document as approved by the Declaration of Helsinki. Four of them consisted on training under different methodologies (traditional training, pyramidal resistance training, reciprocal superset and agonist superset (2)) performed with the same volume (60 repetitions), same rest (90 sec) and intensities ranged from 60 to 80% of 1RM. The other two sessions consisted on 1RM assessment: Three days before the first and the third session. To evaluate acute fatigue pre-post session measures of power loss, lactate concentration, rating of perceived exertion (RPE)and total training volume were measured.

RESULTS

Power data showed differences between pre and post session with the four training methodologies, nevertheless no differences between methods were found. The increase in lactate concentration post-session showed differences between reciprocal superset and both traditional (p=0.008) and pyramidal (p=0.009) and between agonist superset and both traditional (p=0.014) and pyramidal (p=0.005). A trend to significance was found in RPE between reciprocal superset and pyramidal (p=0.055). No differences were found in total training volume between methodologies.

DISCUSSION

The measure of lactate concentration showed that reciprocal and agonist supersets cause a higher demand compared with traditional and pyramidal training. The results of this study are in agreement with the study of Kelleher et al. (3) which showed the increase of lactate intra-session as a good way to differentiate the acute demand produced by different methodologies of strength training. It is necessary more subjects to determinate if power loss, RPE or assisted repetitions may differentiate the acute fatigue produced by different training methodologies.

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Poster

PROFILE OF TWO DIFFERENT METHODOLOGIES FOR IMPROVE MECHANICAL POWER

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INTRODUCTION

Strength training (ST) aimed to increase muscle power is considered an essential performance factor of many sports. The effectiveness of a ST program will depend on the application of appropriate training loads (1). Among training load, the number of repetition performed at maximum power in each set will be fundamental. The aim of this study is to know the effects of two resistance training based on the maintenance of mechanical power.

METHODS

Nineteenparticipants took part in the study. All subjects completed an informed consent document as approved by the Declaration of Helsinki. Subjects had no regular experience in strength training, and they performed a familiarization period of three sessions for bench press throw exercise. Before intervention, 1 repetition maximum (1RM) and maximum concentric mechanical power development in 30, 40 and 50% of RM was calculated with anisoinertial dynamometer (T-Force System). Subjects were divided in two groups: Individualized group (IG) and atraditional group (TG). Training consisted of 8 sessions (2 session × week) with 48 hours of rest among each session andkinematic data were record at all sessions. The intensity used for IG group was individualized based on their optimal load, and volume was individualized on their power area (maximum number of repetition achieve at their 90% peak power in their optimal load). TG performs the number of repetitions recommended in the literature for maintenance of mechanical power (2).

RESULTS

Significant differences were shown between groups in 5 sessions starting from 3rd bout. Repeated measures ANOVA only showed significant differences in 4 sessions for IG (between the first and the last bout ($p<.05$)). While it showed significant differences in 7 sessions for TG emerge from 2nd or 3rdbout ($p > .01$).

DISCUSSION

Results showed that IG was able to perform more repetitions in their power zone than TG, providing a higher quality in power-based ST program. These results suggest that individualization of the load and volume aiming to develop mechanical power seems to be a better choice than traditional recommendations.

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THE IMPACT OF DETRAINING AND CESSATION OF TRAINING ON AEROBIC PERFORMANCE IN SOCCER PLAYERS

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INTRODUCTION

Detraining is the loss of physiological adaptations and performance when training is reduced or stopped completely. Physiological declines occurred in muscle strength and power, aerobic power, anaerorobic capacity, as well as in body composition (García-Pallares et al., 2010; Sotiropoulos et al., 2009). An alternative way to reduce the decline in aerobic performance during detraining periods with training cessation is the implementation of a reduced training program (intensity, volume, and frequency) (Houmard et al., 1989; 1992). Especially, an off-season training program is important to maintain fitness as well as pre-season programs to improve fitness. There is limited information concerning the impact of an off-season training program on aerobic performance in elite soccer players (Bangsbo & Mizuno, 1988; Sotiropoulos et al., 2009). The purpose of the present study was to investigate the effect of a 30-day detraining period, either with training cessation or following an off-season training program, on maximal and submaximal aerobic performance measures in soccer players.

METHODS

Eighteen (18) elite professional soccer players voluntarily participated in the study and were assigned to a control group (CG; n=9; training cessation) or to an experimental group (EG; n=9; followed an off-season training program). The off-season period took place in the summer break for a total of 30 days. The first 10 days, both CG and EG stopped exercising, allowing physical and mental recovery. After the first 10 day off-season period, CG continued the training cessation without following any systematic exercise program or athletic activities according to their interview. On the other hand, EG followed an off-season moderate endurance training program for the rest of 20-day off-season period (three weeks). Off-season training was designed to maintain physical fitness in soccer players. Training sessions were conducted 3 times per week on non consecutive days for EG with each session lasting 45min to 1 hr. Both groups were evaluated before and after the detraining period on body composition, VO_2max, vVO_2max, running velocity at a fixed blood lactate concentration of 4mmol/l (v-4mM), and heart rate responses and blood lactate concentrations at sub-maximal running velocities during an incremental running test.

RESULTS

ANOVA for repeated measures revealed significant (P<0.05) time by group interaction for (%)body fat, VO_2max v-4mM, and vVO_2max. Significant (P<0.05) smaller declines were observed in EG compared to the CG on %body fat (16%vs38%), VO_2max (4.5%vs8%), v-4mM (7%vs11%), and vVO_2max (7%vs10%). A significant (P<0.05) main factor (time) effect was found for blood lactate concentrations, %VO_2max and %HRmax at sub-maximal running velocities.

DISCUSSION

There is general agreement that cessation of training causes decline of the aerobic performance measures in well-trained endurance athletes (García-Pallarés et al., 2010; Sotiropoulos et al., 2009). The results of the present study indicate that the cessation of training has a negative impact in the aerobic capacity of soccer players, returning to their previous pre-season VO_2max values. On the other hand, an off-season moderate endurance training program can avoid excessive reductions in aerobic performance characteristics of soccer players. These findings are in accordance with the results of a previous study in world-class kayakers and soccer players (García-Pallarés et al., 2010; Sotiropoulos et al., 2009). However previous investigators (Houmard et al., 1989) suggest that a short-term (3-4 weeks) reduced training program can maintain VO_2max in endurance athletes (by a 3-week reduction in training volume of 70% and frequency of 17%). The VO_2max reduction in our study in comparison to Houmards's study may attributed to the different reduced training program in training volume and intensity. In the present study there is initially a cessation of training for 10 days and after a 60% and 50% decline in volume and frequency, respectively, with the most important factor to be the decline in the intensity. During the competitive period 15%-18% of the weekly intensity was above the lactate threshold, whereas the intensity during the whole three week off-season training period was under the lactate threshold. Future studies should examine the use of different and more specific modalities of training with different frequency, intensity and volume during the off-season such as small-sided games that simulate the physical fitness components requirements of soccer play and ensures the physical progress of soccer players.

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Poster

RESISTANCE TRAINING IN COMMUNITY-BASED EXERCISE PROGRAMS FOR TYPE 2 DIABETICS: *DIABETES EM MOVIMENTO®* TRIAL

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INTRODUCTION

Resistance training is widely recommended for type 2 diabetes treatment and control in addition to aerobic exercise.[1] *Diabetes em Movimento®* is a community-based supervised exercise program[2] designed for patients with type 2 diabetes that combines aerobic, resistance, agility and flexibility exercise. This study aims to present the resistance training protocol integrated in *Diabetes in Movimento®*.

RESISTANCE TRAINING PROTOCOL

Diabetes em Movimento® group exercise sessions are held three times per week on non consecutive days (mondays, wednesdays and fridays) with a duration of around 70 minutes. Around twenty minutes are dedicated to resistance training. In each session participants perform a total of six exercises for muscle strengthening – three exercises for lower limbs and three exercises for upper limbs and torso. All exercises are performed only with bodyweight, chairs, dumbbells and fitness balls. There is a total of 30 different exercises. The exercises are organized in circuit mode with no rest between exercises and 1-min rest between each circuit. The number of series ranges between two and four, depending on the experience of each participant –there is a slow progression in the number of series along time. In the bilateral exercises are executed 20 repetitions in each serie and in the unilateral exercises are executed 30 repetitions alternately. Exercise intensity is controlled using Borg´s rate of perceived exertion scale. Increases in exercise load is accomplished when participants perform the number of repetitions of each serie without local muscle fatigue. Exercise sessions are supervised by exercise professionals.

DISCUSSION

Resistance training should be an important part of exercise programs for patients with type 2 diabetes.[3] *Diabetes em Movimento®* integrates a high applicability exercise protocol for resistance training with low-cost material resources that is easily replicated in community settings.

FINANCIAL SUPPORT

Diabetes em Movimento® Trial was funded by *Portuguese Foundation for Science and Technology* (SFRH/BD/47733/2008) and is registered in *Current Controlled Trials* (ISRCTN09240628).

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Poster

HANDGRIP STRENGTH AND HAND DIMENSIONS IN HIGH-LEVEL INTERNATIONAL KICKBOXERS

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INTRODUCTION

Both handgrip and hand dimensionsare essential in many sports, including kickboxing, where 1/3 of the hits are hand-performed. Some general and hand-specific anthropometric dimensions have been positively related to handgrip strength. (1,2), Therefore, the aim of this study was the influence of general and hand anthropometric parameters in handgrip strength and sport achievement, in fact, many sports require a sustained level of hand prehensile force to maximize control and performance (2, 3) as well as to reduce the possibility of injuries (4).

METHODS

Forty kickboxers aged 18-51years participants of the International Championship of Alicante, Spain 2010 took part in this study. Body height and body mass were measured and body mass index was calculated as general anthropometric parameters. Three groups of hand specific parameters were measured: finger spans, finger lengths and hand perimeters. The maximal handgrip strength in both hands was measured with a hand dynamometer (GRIP-D TKK 5401, Takei Scientific Instruments CO). We measured of specific anthropometric parameters of the hand according to Visnapuu and Jürimäe [5] criteria. Reliability of hands anthropometrical parameters was assessed using 2 way average measures ICCs.The analyses were done using SPSS 18.0 (SPSS Inc. Chicago, IL).

RESULTS

General and specific (finger lengths, hand perimeters) handdimensions were significantly different among the weight groups ($p<0.05$) and positively correlated with handgrip strength for the whole group. However, only a few dimensions –IFL,MFL,P4,P5– were positively correlated among weight groups. Poor correlations were found between hand-specific variables –TL,IFL,MFL,P4– and sport achievement. Only P3 was highly correlated with sport achievement and together with FS1 explained of its variance.

CONCLUSSION

The results in this study, indicate that the handgrip strength is mostly dependent on the basic (body height) and hand-specific (IFL, MFL, and P4) anthropometric parameters. Sport achievement was related to hand perimeter (P3), but its variability was weakly explained and thus, specific handdimensions may not be good predictors for kickboxing performance.

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Poster

EFFECTS OF 8 WEEKS STRENGTH TRAINING ON VERTICAL JUMP PERFORMANCE IN ELITE MALE VOLLEYBALL PLAYERS DURING THE IN-SEASON

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INTRODUCTION

It has been suggested that to improve the vertical jump performance, volleyball players must complete specific volleyball resistance training (1); however, few data are available about professional male volleyball players. The purpose of this case report is to examine the effects of 8 weeks of combined strength and jump exercises training on the vertical jump ability in a group of senior elite male volleyball players during the competition season.

METHODS

Nine professional male volleyball players took part in this study. The neuromuscular performance was estimated by unloaded (CMJ) and loaded countermovement jumps (CMJ_{loaded}) height (cm); and by velocity of displacement in the concentric phase of full squat (FS) ($m \cdot s^{-1}$). Training took place 2 $d \cdot wk^{-1}$ during 8 weeks (16 sessions). The resistance exercises were FS, hang power clean and loaded jump. In FS, 2-3 series of 4-6 repetitions were realized with a load which was gradually increased from 50% to 65% of 1RM. In power clean, 3 series of 4-6 repetitions were realized with the maximum load that allows a correct technical execution. In loaded jump, 2-3 series of 4-5 repetitions were realized with a load which was gradually increased from 50% to 80% according to the weight with which the athletes reached a height of about 20 cm.

RESULTS

There was a significant increase in CMJ and CMJ_{loaded} (3.4% and 5.8%; $p<0.05$; respectively). No significant changes were observed in FS (0.14%; $p>0.05$).

DISCUSSION

The main aim of our study was to evaluate the effect of strength training on jumping ability during the competition phase in professional volleyball players. The results of our study showed a significant improvement in vertical jump ability after 8-wk training period. Results similar to ours were observed by Marques et al., (2) after 12-wk resistance training with training loads ranging from 50 to 75% of 1RM, and by Häkkinen (3) after 10-wk training period (loads>75% 1RM), in competitive phase (3.8% and 4.5%, respectively). Our results suggest that the use of moderate loads could produce similar results on vertical jump performance to the use of high loads, since in our study a load equivalent to 60% 1RM in the FS was not exceeded and jumping exercises were performed with light loads. These results indicate that the specificity of training, which in this case is expressed by the proximity of the velocities of execution of the training exercises to the velocity of execution of the vertical jump, is determinant for the performance.

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EFFECTS OF 8 WEEKS OF TRADITIONAL AND MODIFIED HIGH-RESISTANCE CIRCUIT TRAINING PROTOCOL IN BASKETBALL PLAYERS

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INTRODUCTION

The aim of this study was to assess physiological demands of competitive basketball by measuring different variables during practice games. Basketball is a sport that requires high physiological demands, being physical fitness a fundamental characteristic in basketball players (1). High-resistance circuit (HRC) training has been usedto obtain positive changes in body composition and maximal strengthwhen it was compared to a traditional strength training (2), however to carry out this training protocol is necessary to have all the available machines. Due to the lack of time to train, we believe that a modified HRC (HRC_M) could be a good way of reducing in 44 % the total time of training in comparison with the HRC. Therefore, the aim of this study was to compare the effects of a HRC_M (continuous block) vs. HRC as a proxy for reducing basketball training time.

METHODS

Fourteen basketball players (19.9±6.4 years) were divided in 2 groups: HRC methodology (G1=7), and modified HRC (HRC_M) (G2=7). HRC was completedin 2 blocks of 3 exercises each, while HRC_M was performed in 1 block of 6 exercises combining upper and lower body training.

The training was performed 2 days weekly, during 8-wk with a non-lineal periodization (1-3 sets). The intensity was of 6RM. Inter-exercise rest was 35" in both protocols, while local rest was 3´ in HRC and 5´ 12" in HRC_M. Maximal strength in bench press (RM), percentage of fat mass (%FM) and fatigue index (FI) ina modified repeated sprint ability (RSA) test along 20-m was measured in pre and post-test.

RESULTS

Percentage of FM decreasedstatistically significant ($p \leq 0.05$) between pre and post-test for G1 (-1.6±2.9%) and a trend to signification ($p \leq 0.1$) in G2 (1.6±2.2%) was observed.No significant differences were found in FI during RSA (G1=4.7±8.1%; G2=3.0±2.6%). Neither significant changes were found to RM in bench press (G1=1.2±2.2; G2=6.2±7.9kg). Interestingly, HRC_M reduced the training time in a 44% in comparison to HRC.

DISCUSSION

A significant reduction of the %FM was observed in both groups. Similar results were reported by Alcaraz et al. (2) after 8-wkof HRC protocol with trained subjects. No significant differences were obtained in FI during RSA, contrarily to whatMarín-Pagán et al. (3) reported, in whicha significant reduction in FI were observed in soccer players. Moreover, we did not observe differences in bench press RM, in contrast with other studies (2,3) with the same protocol. These differences could be due to participant differences between studies (ST experienced participants vs. basketball players). HRC_M training can be considered as an alternative of HRC, obtaining similar results than HRC in terms of maximum strength, body composition and fatigue index in the repeated sprint with a reduced training time (44% less).

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Poster

CHARACTERISTICS AND EFFICIENCY OF DEFENSE IN BEACH VOLLEYBALL WOMEN'S TEAM

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INTRODUCTION

Beach volleyball is an opposition cooperation sport confronting two teams of two players, characterized by high levels of physical, technical and tactical demand (1). Both players can do different specialties like blocker or defender (2). Defenders have to defend 32 m^2 in the best conditions. To do the defense in the best way, it is necessary to know which types of defense are better to get perfect defense. The purpose of this study was to determine the use and effectiveness of the type of defense.

METHODS

A total of 71 sets, 3079 defenses of 22 women's teams from the Olympic Games Beijing 2008 were analyzed. An observational and correlation design was used. The variables studied were: a) type and effectiveness of technique and b) effectiveness of placement. Highest values (0.93) were found in all variables in inter-observer reliability study. Non-parametric chi-square tests were used. The data were processed using Microsoft Excel and SPSS.

RESULTS

Significant differences were found between defense technique and efficacy. The technique of forearms defends produced a significantly higher perfects conditions to make a god set ($p< 0.000$). Forearms defends was the most technique used (30%) than "others" (7.8%). When the players makes "other" defends have more situations to get any options to set. In relation to zone of defense, significant differences were found between zone and efficacy ($p< 0.000$). The zone most often used and effectiveness to defend was zone 5 and zone 1 (26% and 25%, respectively).

DISCUSSION

Forearms defends was the type of defense most used and the one of them that obtained perfect situations to do the next action (set). This value coincides with Homberg and Papageorgiu (3). This values can be explained by the fact that make a forearm defends generate more control in the ball, because the player is an standing position, adapted from Ávila (4). The values of defense placement show that zone 5 and zone 1 are the most used. The reason for this behavior might be explained because both zones usually are initial position by the players to make the defense. These values are different compared with Homberg and Papageorgiu (3). The explanation could be that these authors used different zones to analyze the defense.

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EFFECTS OF HIGH-RESISTANCE CIRCUIT TRAINING (HRC) IN FEMALES AND MALES BASKETBALL PLAYERS

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INTRODUCTION

In basketball, the ability to generate maximal strength levels in short time (mechanical power) has been considered determinant to optimize high performance (1). Circuit weight training (CWT) could be a good tool for strength training to improve strength and power (2) and minimize training time (3).A recent study measured the physiological responses to CWT, which showed higher levels of force production in men compared to women(5). Because there are different adaptations depending ofthe gender and HRC training has found positive results in men (2, 3), the aim of the present study was to compare if the adaptations produced in menare different to those found in women.

METHODS

14 basketball players (20.5±4.9 years) participated in this study (G1=7males; G2=7females) and completed an 8-wk training period (1-3 sets: 2 blocks x 3 exercises at 6 repetition maximum (RM), twice weekly. The rest time between exercises was 40" and the local rest was 3'. Percentage of fat mass (%FM), 1-RM and fatigue index (FI),measured ina modified (20-m) repeated sprint ability (RSA) test, were determinated in pre-post test.The significance of differences between measurements was evaluated by "t student" inter-group and intra-group. Alpha level ($p<0.05$).

RESULTS

No significant differences were observed between pre and post-test in %FM (G1=-1.58±2.92%; G2=-0.61±1.89%) and in FI (G1=-2.19±3.53%; G2=-5.48±5.46%).1-RM was improved significantly ($p<0.05$) in pre-post of bench press in females (G1=2.9±4.4kg; G2=3.8±2.3kg) only, while no significant differences in ½ squat in any of the groups (G1=3.7±5.5kg; G2=4.6±5.5kg) were found. No significant differences were observed inter-groups.

DISCUSSION

%FMdata differ fromother studies, whichsubjectsdecreased significantlyFM (2,4). These differences between studies could be explained by the different characteristics of subjects (trained men and soccer players). No intragroup significant differences were observed in RSA both in men and women, beingthese data different from Marín-Pagán et al. (4), where, soccer players improved significantly in a traditional RSA with the same protocol.Maximal strength, measured by1-RM, improvedsignificantly in pre-post of bench press in female players, similar results fromAlcaraz et al. (2). However, no significant differences were observed in½ squat in any group. The data are different from other studies about HRC; the differences could be explained because the subjects are different and the sample was very low. Despite no significant intra-group differences, the adaptations were similar in both groups sinceno significant differences were found between groups.

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Poster

EFFECTS OF HIGH-RESISTANCE CIRCUIT TRAINING (HRC) VS TRADITIONAL STRENGTH TRAINING (TS) IN SOCCER PLAYERS

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INTRODUCTION

Maximal strength training is a key factor for soccer players (1). Effects of HRC protocol have been studied in resistance-trained males (2) but no studies that have focused on effects of HRC in soccer populations. The aim of this study was to compare maximal oxygen uptake, fatigue index and body composition changes after 8-wk of resistance training applying HRC vs. TS protocols in soccer players.

METHODS

18 semiprofessionals soccer players participated in the study (HRC=9;TS=9). Subjects completed an 8-wk training period (1-3 sets: 2 blocks x 3 exercises at 6 repetition maximum, twice weekly). The difference between protocols was the time of rest between exercises (TS=3´; HRC=35"). Local rest was the same (3´) in both protocols. Maximal oxygen uptake (VO_{2max}), fatigue index (FI) in a repeated sprint ability (RSA) and body compositions (DEXA) were determinate in pre-post test.

RESULTS

Trend to significant ($p \leq 0.1$) was obtained in VO_{2max} ($1.3 \pm 2.5 ml \cdot kg^{-1} \cdot min^{-1}$) and significant difference ($p \leq 0.05$) in time to complete the VO_{2max} test (16.4±22.4") only for the HRC group. FI in a RSA test, was reduced significantly only in HRC (HRC=-1.9±1.2%) group. In percentage of fat mass (%FM), both training protocols groups reduced significantly (HRC=-2.7±1.4;TS=-1.1±1.1%) and HRC group obtained significant differences respect TS group.

DISCUSSION

Recently, one study (3) has reported improvements in VO_{2max} ($\sim 5.3 ml \cdot kg^{-1} \cdot min^{-1}$) after 8-wk of concurrent MS and high-intensity endurance training (ET) in top-level soccer players, in our study we obtained minor cardiorespiratory improvements, probably due to total training volume and additional ET in the Helgerud et al. study (3). Also, own data showed that HRC group obtained greater values in time of VO_{2max} test.

This finding could be explained by improvements in energetic efficiency. A lot of studies had reported the importance of repeated sprint during a soccer match (4). Respect %FM, our results in HRC group were similar than those obtained in the other study (%FM=-1.5±1.6%), which applied the same training protocol (2). Therefore, HRC could be considered as appropriate suitable to apply in soccer players to improve in maximal strength, VO_{2max}, FI in repeated sprints and body composition parameters with reduced training time.

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RELATIONSHIP OF PULL-UP PERFORMANCE TO SELECTED ANTHROPOMETRIC ANDBODY COMPOSITION VARIABLES

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INTRODUCTION

The purpose of this study was to explore whether selected anthropometric and body composition variables were associated with pull-ups performance,and to build a regression model to determine the extent to which these variables accounted for the variation in pull ups performance.

METHODS

Twenty sevensubjects volunteered to participate in this study. All subjects were evaluated for their ability to perform a maximum number of free-hanging pull-ups. In addition, anthropometric characteristics, body composition and somatotype were assessed using 16 anthropometric measurements. Difference in pull-up performances and anthropometric qualities between the best (n=12) and worst (n=15) on pull-up performance were compared using the Cohen effect size (d) statistic. Pearson correlation coefficients (r) were used to determine the relationship among pull-up performance andmorphological characteristics. Stepwise multiple linear regression analysis was performed to determinate which of the anthropometric and body composition characteristics predicted pull-up performance.

RESULTS

Athletes with higher pull-up performance tended to be lighter (d=-0.74, p>0.05), leaner (d=-0.6, p>0.05) and had lower fat mass(d=-0.76, p>0.05) and muscularmass (d=-0.69, p>0.05). BMI was lower (d=-0.96, p<0.05) in those athletes withhigher performance. The best also had lower levels of endomorphy (d=-0.64, p>0.05) and mesomorphy (d=-0.7, p>0.05); and greater levels of ectomorphy (d=0.79, p>0.05). The strongest individual correlates of pull-upperformance were BMI (r=-0.54, p<0.01), fat mass (r=-0.51, p<0.01), body mass (r=-0.46, p<0.05), skinfold thickness (r=-0.46, p<0.05), %fat (r=-0.41, p<0.05) and muscular mass (r=-0.40, p<0.05). BMI was the only variable that contributed significantly to the predictive model (r^2=0.29; *F*=10.03;p=0.04).

CONCLUSIONS

In the current study, we have observed that variables related to body size and body composition seems to play an important role on pull-up performance. These results are in concordance with the findings of other investigators (1, 2, 3) who suggest that the ability to perform pull-ups may be heavily influenced by body composition factors. We have also observed that those athletes with higher performances tended to havea balance mesomorph somatotype. Finally, we observed that the only variable that contributed significantly to predictive the pull-up performance was BMI. These results suggest that greater size does not mean greater relative strength to body mass. Although a significant correlation does not imply cause and effect, the association of these qualities provides insight into the factors that contribute to, and limit, pull-up performance.

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Poster

MAXIMAL DYNAMIC STRENGTH ESTIMATION FROM THE LOAD-VELOCITY RELATIONSHIP DURING SQUAT EXERCISE IN NON-TRAINED SUBJECTS: A PRELIMINARY STUDY

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INTRODUCTION

During maximal dynamic strength estimation (RM), subjects with limited experience in resistance training, lifting a maximal weight or a load for a number of repetitions to failure may lead to muscle injury because of muscle tension and/or unstable posture (1).Currently, the velocity at which a load is liftedhas been proposed as a useful mechanical indicator to monitor strength-training prescription. Some authors have confirmed this relationship in bench press (2, 3), although in half-squat, the utility of velocity-based predictions remains to be confirmed. The aim was to test, in a preliminary way, the accuracy of RM prediction in half-squat from the velocity-load relationship in untrained subjects.

METHODS

37 participants (18 females and 19 males; age: 21.7±1.2yrs)performed a submaximal and a maximal half squat test in a Smith machine. During the submaximal test, subjects completed three repetitions at maximum speed with a load equivalent to body weight (BW). Peak and mean velocities (V_{peak}& V_{mean}) of bar displacement were recorded during the upward phasefrom 90° knee flexion. In a subsequent 1-2 RM test, the 1RM for the exercise was calculated. Different 1RM prediction models were constructed by multiple linear regression taking into account gender, load,V_{peak} and V_{mean}. The best fit of the model was cross-validated with 70% of the sample.

RESULTS

Both,V_{peak} and V_{mean}have a significant impact on the RM prediction from the velocity-load relationship when lifting a load equivalent to BW(R^2=66.4; R^2=72.9; p<0.001, respectively). When gender was used as a predictor, no significant contribution to the model was made (p>0.05). A poor fit of the model was obtained when males and females were separately taken to build RM predictive model from V_{peak} and V_{mean} (Males: R^2=27.5 and 52.9; Females: R^2= 28.9 and 24.5, respectively; p<0.05). The cross validation study revealed similar results (R^2=71.2; p<0.001) and Student T-test showed no differences (p=0.253) between predicted and actual RM values (131.54±29.93 vs. 126.26±28.61 Kg; ICC= 0.93; p<0.001).

DISCUSSION

Our results pave the way for estimating RM from the load-velocity relationship during half squat exercise. Despite V_{mean} allowed the best RM prediction, both V_{peak} and V_{mean}during half-squatwith a load equal to 100% BW explained significantRM variance. Our results are in agreement with othersstudies that recommend not obtaining gender-specific formulas, due to the lack of differences in accuracy (4). The model proposed [1RM=163.2·V_{mean})+(2.4·load)-130.31(±15.31)] provides valuable information to untrained subjects starting resistance-training programs, although further researchis needed to optimize RM prediction from velocity parameters.

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INFLUENCE OF GENDER AND WARM-UP CONDITION ON BENCH PRESS: REPETITIONS TO FAILURE AND LIFTING VELOCITY

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INTRODUCTION

Static stretching (SS) is commonly used as a part of the warm-up, although the influence of stretching on kinematics of strength exercises is ambiguous in the literature. It has been suggested that the inclusion of whole body vibration (WBV) in the warm up could has positive effects on muscle strength and power (1). The purposes of this study were: (i) to compare the acute effects of SS, WBV and SS plus WBV (SS+WBV) prior to one set of maximal number of repetitions to failure in bench press at 60% of 1RM; and (ii) to compare bench press kinematics between men and women.

METHODS

Twenty two physical education students (11 males, 11 females) were familiarized with warm-up protocols and 1 RM test in two sessions.

The following week they performed a general warm-up followed by a specific warm-up protocol: SS (20s each stretching), WBV (50Hz, 2.51mm peak-to-peak) or SS+WBV.

Specific warm-up protocols were randomly applied one per week during 3 weeks. After the specific warm up protocol subjects performed one bench press set to failure at 60% of 1RM. Number of repetitions and mean velocityof the concentric phase were recorded with a linear rotary encoder.

RESULTS

The warm-up protocol did not affect the number of repetitions ($p = 0.707$, $\eta^2 = 0.010$) neither the mean velocity ($p = 0.777$, $\eta^2 = 0.007$). Men performed higher number of repetitions than women after all protocols (WBV: 20.3%, $p = 0.013$, $d = 0.90$; SS: 23.8%, $p = 0.000$, $d = 1.50$; SS+WBV 22.1%, $p = 0.002$, $d = 1.30$). Likewise, the mean velocity was higher in men than in women (WBV: 23.1%, $p = 0.000$, $d = 1.58$; SS: 23.1%, $p = 0.000$, $d = 1.88$; SS+WBV: 23.1%, $p = 0.000$, $d = 1.76$).

DISCUSSION

The differences between men and women were according to Courtright et al. (2), whose meta-analysis revealed that males score substantially better on muscular strength and cardiovascular endurance tests. The application of WBV alone or in combination with SS during the warm-up does not provide any benefit to bench press performance in respect to SS alone. Men show a higher performance than women in bench press training with the same relative load.

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Poster

ACUTE PHYSIOLOGICAL RESPONSE TO REPEATED 20+20M SPRINT, KICKING AND JUMP SEQUENCES IN U-19 SOCCER PLAYERS

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INTRODUCTION

In a sport like soccer characterized by intermittent efforts, most actions for the scoring players were straight sprints, jumps, rotations and change in directions sprints (1).

The acute physiological response to classical repeated-sprint has already been described (2), however the physiological response to more specific soccer actions, such as repeated sprint, kicking and jump sequences, it is not known. The aim of the present study was to measure the metabolic response (lactate [La] and ammonia [Am]) as indicator of metabolic disorder in repeated-sprint sequences (RSS).

METHODS

Twenty-one soccer field players from the U-19 Spanish National division were tested. RSS consisted in nine repeated 40-m (20 + 20-m sprints with 180º turns), departing each minute, with a maximal instep kick and countermovement jump performed immediately after each sprint. Capillary blood samples used to determine [La] and [Am] concentrations were obtained from the fingertip before exercise (PRE), and after third (3^{th}RSS), sixth (6^{th}RSS) and ninth (9^{th}RSS) sprint sequence. The Lactate Pro LT-1710 (Arkray, Kyoto, Japan) portable lactate analyser was used for [La] measurements. [Am] was measured using PocketChem BA PA-4130 (Menarini Diagnostics, Florence, Italy). Repeated measures of analysis of variance were used to compare any change in these variables.

RESULTS

[La] and [Am] were increased with the number of RSS performed ([La] PRE, 3^{th}, 6^{th} and 9^{th}RSS were 2.5 ± 0.3, 11.9 ± 4.6, 13.6 ± 3.1, and 14.9 ± 2.6 mmol·L^{-1} respectively; [Am] PRE, 3^{th}, 6^{th} and 9^{th}-RSS were 59.8 ± 2.6, 158.6 ± 61.8, 169.2 ± 43.9, and 182.3 ± 45.2 µmol·L^{-1} respectively). The differences were statistically significant with respect to the values achieved in the previous RSS ($P < 0.01$).

DISCUSSION

To our knowledge, this is the first study that analyzes the acute response during a RSA test with additional specific soccer actions. The present results show that from the first RSS, the acute metabolic response is elevated as demonstrated the blood lactate (~12 mmol·L^{-1}) and ammonia levels (~160 µmol·L^{-1}). These high ammonia levels observed may be associated to a decline in muscle adenine nucleotide stores, mainly by a pronounced reduction in muscle ATP content (3). As a result, the use of RSS with 1min recovery for improving RSA has to take into account the possible subsequent decrement of performance due to the high blood [Am] after only 3RSS.

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INFLUENCE OF STRENGTH ON LOSS OF PERFORMANCE IN REPEATED SPRINT SEQUENCES IN U-19 SOCCER PLAYERS

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INTRODUCTION

Explosive actions like sprints, jumps and kicking, are directly related to scoring a goal (1). However, the ability to maintenance the performance through repeated sprint sequences (RSS) composed by these explosive actions remains unknown. Lower body strength seems to explain part of repeated and single sprints performance (2). Thereby, the aim of this study was to examine the influence of lower body strength on RSS performance composed by sprints, jumps and kicks.

METHODS

Sixteen soccer field players from the U-19 Spanish National division were tested. RSS consisted in nine repeated 40-m (20 + 20m sprints with 180º turns), departing each minute, with a maximal instep kick (KICK) and countermovement jump (CMJ) performed immediately after each sprint. Values of both mean and percent decrement [%DEC = mean/best* 100) – 100] to RSA (20+20m sprint time, RSA_{MEAN}, RSA_{DEC}), KICK ($KICK_{MEAN}$, $KICK_{DEC}$) and CMJ (CMJ_{MEAN}, CMJ_{DEC}), through the nine sequences were calculated. To examine the importance of lower body strength, the players were matched on strongest and weakest from the load lifted at $1m \cdot s^{-1}$ in relation to their body weight in full squat exercise (2). The chance that the true values were greater, similar or lower for between-group comparisons were calculated based on Cohen´s principle (3).

RESULTS

Strongest players had higher performance for RSA_{MEAN} (7.44 ± 0.17 vs. 7.62 ± 0.20 s; P = 0.12, 1/5/94%) and CMJ_{MEAN} (28.6 ± 2.9 vs. 27.9 ± 3.4 cm; P = 0.78, 66/22/12%), whereas for $KICK_{MEAN}$ obtained lower values (88.6 ± 5.5 vs. 90.4 ± 5 $km \cdot h^{-1}$; P = 0.31, 13/29/58%). The decrement was higher for strongest players only in CMJ_{DEC} (18.6 ± 6.8 vs. 16.7 ± 5.6 %; P = 0.38, 55/31/15%) than weakest players. Strongest players achieved slighter values than weakest players for RSA_{DEC} (5.1 ± 2.6 vs. 6.3 ± 3.4 %; P = 0.78, 1/22/66%) and $KICK_{DEC}$ (6.3 ± 4.6 vs. 9.1 ± 4.6%; P = 0.42, 6/17/77%).

DISCUSSION

The main finding of this study was that strongest players obtained greater performance in all variables analyzed, except in $KICK_{MEAN}$ and CMJ_{DEC}. Previous studies (4, 5) have found relationship between soccer player's strength and both sprint and jump performance but the influence of the strength soccer player on the ability to repeat sprints, jumps and kicks has not been studied yet. Therefore, the results of our study suggest that the lower body's strength might let to reach better performance in the ability to repeat explosive actions, which are specific of team sports, such as sprints and jumps.

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Poster

PERFORMANCE CHANGES AFTER AN ACUTE BOUT OF HIGH-RESISTANCE CIRCUIT TRAINING (HRC) AND TRADITIONAL CIRCUIT WEIGHT TRAINING (CWT) IN YOUTH FUTSAL PLAYERS

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INTRODUCTION

Strength and power levels play a key role in order to optimize performance in many team-based sports, included futsal(1). In this sense, a strength training method such as High Resistance Circuit (HRC) may be helpful for teams, which have a limited training time. The effects of an acute bout ofHRC training on power output in well-trained adults have been previously studied (2), but no researches have been found in futsal. Therefore, the aim of present study was to determine the acute fatigue after a HRCsession compared toCWT in futsal players.

METHODS

Thirteen futsal players participatedvoluntarilyin this study. A randomized counterbalanced cross-sectional design with familiarization was used. Participants performed 3 sessions (pre-test + familiarization; training day 1 + post-test; training day 2 + post-test). Countermovement Jump (CMJ), agility test (T-test), ball ability test (Ba-T), kicking velocity (KVel) and fatigue index (FI) repeated sprint ability modified (RSA) in 20 m was measured in pre and post-test. Both training protocols consisted in 4 sets x 6 upper and lower body exercises alternatively. Differences between methods were intensity (HRC=6RM; CWT=15RM) and rest between sets (HRC =37 s; CWT= 15 s), while local muscular rest was similar (5´15") in both protocols.

RESULTS

For CMJ, a significant decrease was found ($p \leq 0.05$) in Rate of Force Development (RFD)after HRC session (HRC=-8.16±5.71 N/s vs CWT=-8.68±4.65N/s). Also, significant differences were showedinBa-Tfor HRC(HRC=0.29±0.32s; CWT=0.17±0.52s), increasing the time to complete the test. T-Test showeda significant drop performancein HRC ($p \leq 0.05$) and CWT ($p \leq 0.001$) (HRC=-0.16±0.16s; CWT=-0.17±0.09s).

No significant differences were foundin FI during a RSA;kicking velocity;and peakforce, peakpower and jump height during CMJ.Nosignificant differenceswere found between groups.

DISCUSSION

The results showed a decrease performance after apply both protocols, in RFD during CMJ and in time during T-Test and Ba-T. In particular, there is a decrease in jumping power, according toGonzález-Ravé et al.,(3), who found a diminish of power in half squat, after applying a high intensity resistance training (HIR) in futsal players.On the other hand, we found improvements in kicking velocity, peak force and jump height in CMJ. Kotzamanidiset al., (4) also reported an improvement in jump height after a HIR. These increases may be due to Post-Activation Potentiation as suggested Mitchell et al., (5).

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Poster

ACUTE EFFECT OF ECCENTRIC OVERLOAD EXERCISE ON VERTICAL JUMP PERFORMANCE

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INTRODUCTION

Eccentric training have generated interest within the strength and conditioning community in recent years, but much of the research to date has produced confounding results in terms of acute effect of eccentric overload exercise (1, 2). The purpose of this study was to determining the acute effects of an eccentric overload exercise (squat in aExxentric®machine) condition on vertical jump performance.

METHODS

Twenty-three male trained students participated in two randomized testing conditions: a bilateral half-squat (BS) and a unilateral half-squat (US) exercise. The BS condition consisted of four sets of seven reps in a flywheel resistance machine with eccentric overload (Exxentric®), equipped with two flywheels with a moment inertia of 0.05 $kg{\cdot}m^{-2}$ eachand with 3 min rest between sets. The US condition consisted of four sets of seven reps equipped with one flywheel with a moment inertia of 0.05 $kg{\cdot}m^{-2}$and the same rest. Vertical jump performance [e.g., countermovement jump (CMJ) and Drop jump (DJ 40-cm)] were carried out before and after each set. Blood lactate during recovery (after 3 min of passive recovery) was carried out before, after 2nd and last set of eccentric overload exercise.

RESULTS

Height in CMJ significantly decreased in BS group POST 1st set (-6.08 %), POST 2ndset (-6.14%), POST 3rdset (-6.87 %), and POST 4thset (-6.61%). Height in CMJ also decreased in US group POST 1stset (-4.23 %), POST 2ndset (-5.07%), POST 3rdset (-5.07 %), and POST 4thset (-6.69 %), respectively after eccentric overload. Height in DJ significantly decreased in BS group POST 2ndset (-5.22%), POST 3rdset (-6.03%), and POST 4thset (-6.12%), but only significantly decreased in US group POST 4thset (-5.04%). Blood lactate significantly increasedduring recovery in BS POST 2nd and POST 4th sets, but did not changed between them (2.1 ± 0.7 *vs.* 4.1 ± 0.8^{a}*vs.*4.6 ± 0.9^{a} $mmol{\cdot}l^{-1}$). However, blood lactate significantly increased during recovery in US POST 2nd and POST 4th sets, and also between them (2.7 ± 1.2 *vs.* 4.5 ± 1.4^{a}*vs.*$5.3\pm2.1^{a,b}$ $mmol{\cdot}l^{-1}$).

CONCLUSION

The results indicate that performing a high-intensity eccentric overload as specific protocol brings negative effects on subsequent neuromuscular explosive responses. Acute negative effects on jumping performance after a high-intensity eccentric overload exercises were maintained after recovery periods, and had no beneficial effect on explosive dynamic muscle actions.

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Poster

EFFECTS OF HIGH-RESISTANCE CIRCUIT TRAINING DURING 1 OR 2 DAYS PER WEEK IN YOUNG BASKETBALL PLAYERS

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INTRODUCTION

In basketball, maximal strength and power levels are a key factors to high performance (1). High-resistance circuit training (HRC), has showed that achieve improvements in maximal strength (MS) and body composition (2). No studies that has focused in effects of different frequency with HRC protocol.

METHODS

8 youth basketball players (14.38 ± 0.52 years) participated in this study. They were divided in 2 groups: group 1 (G1=4) performed 1 training session per week and group 2 (G2=4) performed 2 sessions weekely, both with a training protocol in HRC of 6 exercises (upper and lower body) and intensity of 6RM with ondulatory periodization during 8-wk. Percentage of fat mass (%FM), MS in bench press and half squat (RM) and fatigue index (FI) in modified repeated sprint ability (RSA 20m) were evaluated in pre and post-test sessions.

RESULTS

Significant differences were found only in G2 ($p \leq 0.05$) between pre and post-test on RM in bench press (G1 = 39.65 ± 41.44%; G2 = 23.24 ± 11.75%) and half squat (G1 = 17.85 ± 35.71%; G2 = 13.33 ± 5.95%). In %FM (G1=-1.0±0.9%; G2=-0.3±1.3%) and FI (G1=-0.2±3.3%; G2=-3.1± 2.8%) no significant differences were found in pre and post-test or between groups.

DISCUSSION

The increase in MS in pre and post-test was significant only the G2. These data contrast with those obtained by DeRenne et al., (3) where they obtained significant differences in strength training in young athletes both in one day per week as two. These differences may be due to a long total training program (12 weeks) that they realized. We also see differences with Alcaraz et al., (2) where they were able to reduce significantly the %FM, probably due to differences in study subjects. Therefore, could be considered that 1 day of HRC training per week is not sufficient to achieve improvements in maximal strength and body composition in youth basketball players.

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EFFECT OF SHORT-TERM INERTIAL UNILATERAL AND BILATERAL TRAINING WITH ECCENTRIC OVERLOAD IN JUMPING PERFORMANCE

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INTRODUCTION

Bilateral (BL) exercises, like half-squat, have been extensively investigated to determine the effects of resistance training on strength and power of lower limbs (1). However there is a lack of scientific data about what are the effects of unilateral resistance training, especially if unilateral (UL) exercises are performed with an inertial device. The aim of this study was to describe, for first time, the effects of short-term inertial strength training with BL and UL exercises on jumping performance.

METHODS

Twenty-three young healthy active males (22.09±1.99 years; 77.88±11.17 Kg) participated in our study. Eleven of them were included in a BL group and twelve were included a UL group. Countermovement Jump (CMJ) and Abalakov (AbkJ) were assessed before and after the training intervention. Three attempts were performed and the best of them was used for the statistical analysis. Similarly, strength was measured in half-squat on an inertial machine (K-Box, Exxentric®) equipped with two flywheels (with a moment inertia of 0.05 $Kg.m^{-2}$ each one) for BL group, and with one flywheel for UL. Subjects performed 2 sets of 7 rep with 3 min rest between them. Relative (W/kg) best single concentric power value were used to random the subjects in the two groups. Resistance training intervention consisted on 6 sessions (2 sessions/wk) on the same inertial device. Half-squat (4 X 7 rep) and calf (4 X 10 rep) exercises were performed bilaterally and unilaterally (BL and UL groups, respectively) with the same moment of inertia used in the initial test.

RESULTS

Height in CMJ and AbkJ were significantly higher (3.3% and 3.8%, respectively) after the training intervention in BL group while in UL group, no significant improves were found (1.9% and 2.1% respectively). Likewise, no differences between BL and UL groups were found in jumping performance.

DISCUSSION

Our results suggest that UL and BL resistance inertial training may be equally effective, at least in short term, in the improvement of bilateral power of lower limbs in young active males (estimated by vertical jump tests). Although obtained in an inertial device with eccentric overload, our data seem to confirm those reported by McArCurdy et al (2005) using free weight training.

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Poster

EFFECTS OF WEIGHTED SLED ON GROUND REACTION FORCES IN TRAINED SPRINTERS

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INTRODUCTION

Resisted sprint training has been widely used in many sports to enhance sprint ability. This training method is believed to develop specific strength for sprinters (1), but no studies have focused on effects in ground reaction forces (GRF). Thus, ourpurpose was to determine the effects on GRF in first step using weighted sled in trained sprinters.

METHODS

Ten highly trained male competitive athletes (17.8 ± 1.2 years, 67.3 ± 7.8 kg, 1.75 ± 6.7 cm) participated in the research.

The participants performed five 5-m sprints in a randomized order (unloaded sprints and sprints pulling resistances of 10, 15, 20 and 30% of Bm) from a crouched start. GRF were collected at a sampling frequency of 1000Hz during the first ground contact (Bertec 4060-15). The vertical, horizontal propulsive, and the resultant GRF were obtained for each condition. All the GRF measures were normalized to body mass.

RESULTS

A repeated-measures ANOVA showed no significant effects on GRF while load increased. Otherwise, sled-towing exercise produced a decrease in maximal and mean–absolute and relative- propulsive forces. On the other hand, maximal vertical GRF (absolute and relative) increased when 20% Bm was set, and mean vertical GRF with 30% Bm. Resultant GRF (absolute and relative) diminished with lower load (10% and 15% Bm), and maximal values increased when 20% and 30% Bm was used.

DISCUSSION

Literature suggested that the overload on the athletes in sprinting may increase force output (2), and resisted sprint is hypothesized to increase the athlete's ability to generate horizontal and vertical sprinting forces (1, 2), depending on the direction of the applied resistance arising from the device. The present study confirmed that an increase in sled's load produces a decrease in horizontal GRF. On the other hand, vertical and resultant GRF only rise with highest loads. This result may due to the starting position, as athletes were required to pull themselves from a crouched start. Maulder et al (3) suggested that the use of sled towing led the athletes to push off the blocks in a more horizontal position. This fact may explain the reduction in vertical GRF with lower loads. GRF impulse relative to body mass has been considered to reflects the changes in velocity of the athlete (4), thus, future studies may focus on the effects on GRF impulse to widely determine the effects of weighted sled on kinetic measures.

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RELATIONSHIP BETWEEN LUMBATEX® AND PRESSURE BIOFEEDBACK UNIT IN SEGMENTAL MOTION IN THE LUMBOPELVIC SPINE

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INTRODUCTION

The pressure biofeedback unit (PBU) is a tool developed by physiotherapists to aid the retraining of stabilizing muscles using specific exercises, and detects movement of the lumbar spine in relation to an air-filled reservoir (1). However, most of the exercises performed to train stabilizing muscles of the spine as well as daily activities are performed in other positions that do not have the support needed to use the Stabilizer™.

Lumabatex® is a new device that allows evaluating the posture and segmental changes in the lumbar spine without support points. The aim of this study was to determine the relationship betweenLumbatex® and pressure biofeedback unit in segmental motion of the lumbopelvic spinein healthy young subjects.

METHODS

10 healthy volunteers were recruited for the study. Movement of the lumbar spine was registered indirectly with a Chattanooga Stabilizer PBU and directly with a Lumbatex® in three different scenarios.Prone test.

The participants were instructed to draw the lower stomach gently off the pressure sensor without moving the back or the hips and to sustain it for 10 seconds, measured by a stop watch(2).Prone test modified [1]. The participants were instructed to draw the lower stomach gently off the pressure sensor (decreases the pressure to 40 mmHg) with moving the back or the hips. Prone test modified [2]. The participants were instructed to active the rectus abdominiswith moving the back and to sustain it the same last test until 120 mmHg.

RESULTS

An analysis of variance (ANOVA) was performed to detect the segmental changes of the lumbar spine. The results showed no significant differences for prone test (lumbatex® 5% (p=0,324) BPU -14,3% (70 to 60 mmHg). Prone test modified 1 and 2 showed significant differences changes in Lumbatex®. Increased a 37,9% (p=0,017) when PBU decreased a 42,8% (70 to 40 mmHg) and decreases a 36,74% (p=0,003) when PBU increased 58,33% (70 to 120 mmHg) respectively.

DISCUSSION

The Lumbatex® device allows register changes in the lumbar spine during the development of the different scenarios presented. It is of great interest because it may allow potential use for the control of the lumbar spine during the development of tests or exercises that are not available support surfaces. The information provided by Lumbatex® may be considered as a protective aid when aiming to control the segmental changes of the lumbar spine in different exercises.

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Poster

VALIDITY OF A NEW DEVICE FOR ASSESSING ANKLE DORSIFLEXION RANGE OF MOTION

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INTRODUCTION

Ankle dorsiflexion range of motion is associated with patellar (1) and ankle injuries (2), also having an important implication in the performance of strengthening exercises (3). Despite the weight-bearing lunge test, the goniometer and the digital inclinometer are usually used to assess ankle dorsiflexion range of motion (ROM) (4), there is no universal agreement regarding which measurement device is most preferred (4). An alternative option could be the Leg Motion test, which is a portable device designed to assess ankle dorsiflexion ROM, miming the weight-bearing lunge test condition while allows a greater standardization. However, no study has been conducted to evaluate the association of this novel device with other typical ankle dorsiflexion range of motion measures.

METHODS

Fifteen healthy male subjects (age=23±3 years) took part in this study. The Leg Motion dorsiflexion ROM was assessedaccording to procedures for the performance of the weight-bearing lunge test (4) and both tests were performed in a counterbalanced order. In addition, other ankle dorsiflexion ROM measures were obtained during the weight-bearing lunge position using a standard goniometer and a digital inclinometer.

RESULTS

Paired t-test showed the absence of significant differences between right and left limb in all the tests. Mean values ± standard deviations were as follows: Leg Motion (left 12.49cm±3.51; right 12.70cm±3.0), weight-bearing lunge test (left 11.52cm±3.71; right 11.71cm±3.56), goniometer (left 43.20º±5.46; right 42.56º±5.64), and digital inclinometer (left 42.18º±6.65; right41.42º±5.91). The Leg Motion composite values (i.e., average of the two legs) showed a significant ($p<0.05$) positive correlation with the weight-bearing lunge test ($r=0.99$), with the goniometer ($r=0.85$) and with the digital inclinometer ($r=0.86$).

DISCUSSION

This is the first study that aims to validate the Leg Motion. The high correlation values during the Leg Motion test show their validity as an alternative to the weight-bearing lunge test, goniometer, and digital inclinometer for the measurement of the ankle dorsiflexion ROM.

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TIME MOTION ANALYSIS IN U-14S AND U-16S DURING COMPETITIVE 11-A-SIDE FOOTBALL MATCHES

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INTRODUCTION

Competition is considered as a key element in the development in the youth football player formative process (1). To that end, the competitive formats needs to be adapted to the characteristics of those involved (2), and this does not always happen.

By understandingthe physical demands generated by the competition in the players, through different age periods, appropriate training strategies will be identified to optimize the competition model.

METHODS

Time-motion match analysis data was collected on 44 young football players (24 U-14; 20 U-16) on 18 official 11-a-side football matches (9 for each age group).Portable global positioning system (GPS) devices were used to record the following variables: total distance covered (DC) and distance covered in different speed zones, work-rest ratio (W:R), maximum velocity (MV), player-load (PL) and distance and frequencies of sprints.

RESULTS

U-14 football players presented significant lower values during the second half on DC, PL, W:R and distance covered in medium speed zone (8-13 $km \cdot h^{-1}$). However, no significant differences between halves were found for U-16 players.

DISCUSSION

A decrease on fitness performance was observed in U-14s during the second half, similar to other studies (3). On the other hand, we underline that there were no physical activityvariation along the match in U-16, so that, no sign of fatiguewas found in this age group. The study concludes that 11 vs. 11 formatseems to be adequate to U-16s, since allows it them to maintain the same pace game (4) during the second half. However, physical demands for U-14s seem to beexcessive to their characteristics to keep the physical activity constant during the game. In this line, other studies to isolate variables like pitch dimensions, number of players or duration of each part, could be implement to adequate competition formats to the possibilities of each age group.

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Poster

CHANGES IN PLANTAR PRESSURE DISTRIBUTION DURING NORDIC WALKING ARE CONSTANT BETWEEN DIAGONAL AND ALFA TECHNIQUE

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INTRODUCTION

During the practice of Nordic walking (NW) ground reaction forces are higher than during walking (W) (1). This increase is associated with the technique employed during NW (2). Previous studies (3) demonstrated that the practice of NW reduced plantar pressures by 50% in the central metatarsal (CM). The objective was to analyze the differences in plantar pressures distribution during NW with Alpha (AT) technique against Diagonal (DT) technique and these in turn with walking.

METHODS

Twenty physically active students were randomized into a group of Alfa technique (n=15) and a group of Diagonal technique (n=12). Nordic walking and walking was performed at the subject's preferred speed, controlled by two photocells (Velleman PEM10D ®), along a walkway. Plantar pressures were recorded with an insole (Biofoot ® device, Valencia, Spain) at 750 Hz. Three steps per trial, between the photocells, were selected for analysis. A two-way ANOVA were performed in order to analyze whether there were differences between the means in plantar pressure taking into account the types of walking (NW vs W) and technique (DT and AT).

RESULTS

Both groups show a significant mean decrease (p=.012) of 46.2% in the NW in CM compared with normal walking. Small differences in plantar pressures were found in the NW depending on the technique used (DT vs. AT). Specifically, the AT group had lower pressures in the area of the calcaneus (H) (p=.046, <44.7%) and the lateral metatarsals (LM) (p=.015, <57.3%) compared with the DT group.

DISCUSSION

The results are consistent with previous studies (3) which show a significant decrease in the CM area during the NW compared to W, assuming a reduction of joint loading in the foot during NW. As relevant change it has been shown that small differences exist between techniques, being Alpha technique the group, which lower pressures recorded in the areas H and LM. While there are no major differences with W, so it could be concluded that both techniques report the same benefits described in previous studies in comparison with walking.

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Poster

CHANGES IN CADENCE AND AMPLITUDE AFTER A RUNNING TECHNIQUE TRAINING PROGRAM WITH MINIMALIST FOOTWEAR

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INTRODUCTION

Recent studies have highlighted the importance of the striking pattern during running (1). Also, running barefoot or in minimalist footwear has grown in popularity in recent years (2). There kinematic and kinetic differences between running with normal shoes, barefoot or in minimalist shoes (3). Such differences respond to acute changes in time, but may also be due to changes in space-time variables (3). Previous studies have demonstrated acute changes in cadence and stride length depending on the type of strike pattern and the type of footwear (1).

METHODS

42 recreational athletes were randomly divided into two groups according to the footwear used: minimalist (MF) (n = 20) and traditional (TF) (n = 22). All of them participated in a seven weeks training program (3 t/w) of a transition from a heel strike to a midfoot strike. Changes in parameters of cadence and stride length on a treadmill at 3.3 m/s were measured by using two accelerometers placed in right tibia and head (Miniature PiezoBeam ® 8640A50, Kistler, Switzerland). A two-way ANOVA was performed to determine the effect of the training program and its relationship with the shoe.

RESULTS

After the intervention program, no significant differences ($p < 0.05$) associated with the type of footwear were found. However, after the training process, we found a small significant changes ($p = 0.03$, $F = 7.87$, $\eta^2 = 0.07$) in cadence (pre = 2.78 ± 0.04 step/sec; = 2.88 ± 0.06 post step/sec) and in amplitude (pre = 2372.1 ± 38.7 mm; post = 2297.7 ± 44.7 mm) in the group of TF.

DISCUSSION

We can concluded that a period of seven weeks of technical training was not enough to objectify changes in spatio-temporal parameters like cadence and stride length in a group of minimalist footwear. These results are consistent with previous studies (1), but differ from other (3) in which changes were observed.

These changes are due to manipulations of conditions performed in this study, in which subjects were told to changes the type foot striking during running, whereas in our study volunteers were forced to change the foot striking.

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Poster

BIOMECHANICAL ANALYSIS OF THE SNATCH IN NOVICE WEIGHTLIFTERS –A CASE STUDY

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INTRODUCTION

One of the most important aims of weightlifting sports is to develop a technique that enables athletes to lift heavy weights. From the biomechanical point of view, one variable to drive performance often referred to in the literature is bar velocity. For elite weightlifters, the importance of peak velocity to performance is widely accepted (1). However, in novice weightlifter, bar velocity was not a primary feature contributing to a successful lift. In that case greater importance should be done to barbell velocity with weightlifter moving as a system and the height of the squat position in the catch phase (2). Therefore, the purpose of this study was to determine the barbell and system (body plus barbell) CG kinematics (calculated from the marker at sacrum) in the snatch to identify the factors associatedwith successful and unsuccessful lifts for novice weightlifters.

METHODS

Eight successful and three unsuccessful snatch lifts were performed by three male novice weightlifters (age: 25±4.58yrs, height: 179.1±6.16 cm, weight: 94.6±14.57kg). Each lifter performed two loads which are the 60% and 95% of their one repetition maximum (1 RM) for analysis. Twelve QualisysOqus cameras were set up to capture 3D motion of the subject and the movement of the barbell. The movement was divided into 5 phases based on the height of the barbell and the change in which the knee moved.

RESULTS

Bar displacements in successful and unsuccessful lift in each phase was expressed as percentage of stature. Results obtained were32.6±2.1 VS 32.16±0.70 cm for the 1st pull, 41.18±3.74 VS 40.03±1.12 cm for transition phase, 57.09±2.35 VS 57.26±1.01cm for the 2nd pull, 84.51±4.00 VS 78.20±4.45 cm for turnover phase, 66.83±2.6 VS 24.43±42.32 cm for catching phase, respectively. Velocity of the bar were 1.24±1.72 VS 1.12±0.15 m/s for the1st pull, 0.92±0.20 VS 0.76±0.1 m/s for transition phase, 2.37±0.33 VS 2.23±0.33 m/s for the 2nd pull. Velocity of the system were 0.25±0.08 VS 0.14±0.67 m/s for the 1st pull, 0.49±0.17 VS 0.53±0.69 m/s for the 2ndpull, 0.43±0.60 VS 0.36±0.63 m/s for turnover phase.

DISCUSSION

Bar displacement were more different between subjects than between successful and unsuccessful lifts. Unsuccessful lifts showed a lesser velocity of the bar from the 1st pull to the 2nd pull phase than successful lifts. This is consistent with the lower height in turn over phase and failed to squat in the catching phase. Velocity of the system was lesser in unsuccessful lifts explained that the subjects may have over-extended in the1st pull phases and begins to lower the body before the end of the pull phase. Therefore, the system velocity can be one of the indicators to explain why novice weightlifters are failing to lift beside the bar velocity and the height of the squat position in catching phase.

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Poster

THE PROGRESSIVE INCREASE IN BODY WEIGHT AFFECTS LEG STIFFNESS DURING RUNNING AT DIFFERENT VELOCITIES

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INTRODUCTION

It is well established that running speed is directly related to stiffness of the legs (Brughelli & Cronin, 2008). Subjects increase the stiffness in order to adapt the vertical displacement of the center of mass (CoM) and contact times to the new physical constraints. This increased stiffness of the leg may lead to a lower energetic cost (Ferris & Farley, 1997). The aim of this study is to test the effect of different loading conditions (using weighted vest) on kinematics during running at different velocities.

METHODS

Two different experimental sessions were carried out in this study. In a preliminary session the Maximal Aerobic Speed (MAS) was tested using an incremental treadmill test. In the second session the effect of different running speeds and loading conditions on the kinematics of running were randomly tested. Thirteen healthy male subjects (24.00±1.73 yrs; 71,63±10,19 Kg; 174,33±6,19 cm; MAS: 4,65±0,32) were required for running on a treadmill under different velocity (60%, 80% and 100% of MAS) and loading conditions (0%, +10% and +20% of the BW). The increments in BW were carried out through weighted vest. The treadmill was implemented by a OptoGait® for recording kinematic data (fligh time –FT– and contact time –CT–). Then, vertical displacement of the CoM (Δy), leg compression (ΔL), peak ground reaction force (F_{peak}), vertical (K_{vert}) and leg (K_{leg}) stiffness, were computed using the model proposed by Morin et al. (2005). A two way repeated measures ANOVA (velocity x load) was performed on the above mentioned variables. The alpha level was set at $p \leq 0.05$.

RESULTS

ANOVA-MR showed a significant effect of the speed factor and the load factor ($p<0.05$ for all comparisons) in the next variables: CT, FT, Δy, ΔL, F_{peak}, K_{leg} and K_{vert}. When the speed is increased, subjects showed shorter CT and higher FT. These kinematics changes produce an increase in K_{leg} and K_{vert}, due to a further increase in F_{peak} and a lowered Δy and ΔL. In contrast, when load is increased, subjects showed an increase in CT and a decrease in FT. Despite the change in the running kinematics, subjects experienced an increase in K_{vert} without changes in K_{leg}.

DISCUSSION

Present results are in accordance with previous studies that showed an increase in K_{vert} and K_{leg} when running speed is increased (Brughelli & Cronin, 2008). Furthermore, results from present study have shown how different overload conditions can robustly affect the kinematics of running. This is in line with data from Cross et al. (2013), which have shown how different Vest loading affect the maximal sprint running kinematics. This study must be taking into account by coaches when using weighted vest in order to improve the athlete's performance.

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Poster

DOES DECISION MAKING WHEN PASSING THE BALL AFFECT THE RESULT IN A FOOTBALL MATCH?

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INTRODUCTION

Nowadays, decision making analysis on sports people is a topic of great interest. This analysis can be a determining factor in performance, and being able to predict it can be one of the most valuable tools for success (1). A football player must take into account many factors when passing the ball (height, distance, direction, etc), not only must he decide which player is better situated, but he also needs to decide which direction the ball must take, the kind of kick, precision, when to kick, etc. (2).

METHODOLOGY

The sample was 20 participants of a Third Division Club, group XIII (24 ± 2 years), which were classified according to the specific position that performed in the field (2 Goalkeepers, G, 4 wide defenders, WD, 3 central defenders, CEN, 3 Middle Centers, MC, 4 wide midfielders, WM, 2 Middle attackers, MA, and 2 attackers, A). It was nalyzed eight matches in the league with observational methodology through viewing video-recorded. We used three variables: successful passes (SP), interceptions (PI) and not successful passes (NSP), also qualifying passes as the distance in short passes (PS) (<10 meters), media passes (MP) (10-20 meters) and long passes (LP) (> 20 meters). These variables were analyzed in terms of the situation that the player gave the partial score of the game.

RESULTS

When a team is loosing, 74,7% are PS and only 5,3% LP, and if it is winning, the average is of 1,69±0,99 PS per minute. On the other hand, when the team starts winning, it performs an average of 1,69±0,99 PS per minute. As far as accuracy is concern when passing the ball, when winning, 80% are SP and 79% when they are loosing or the have equal scores. In the case of the latter, the team performs an average of 0,61±0,1 NSP per minute, whereas if they are winning or loosing they perform an average of 0,48±0,11 and 0,48±0 PNA per minute respectively.

DISCUSSION

With regards to the results of a football match, there are no meaningful differences when it comes to passes (according to distance and efficiency) when there is a draw, or the team is loosing. However, there are differences when the team is winning, given that as can be seen from the results, players pass the ball less than when they are loosing or there is a draw. Following the studies carried out by (3) found variations in ball possession with regards to score, verifying that ball possession increased when teams were loosing, and it decreased when they were winning (4,5 and 6).

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KINEMATICAL AND COORDINATIVE CHARACTERIZATION OF FRONT CRAWL AGE-GROUP SWIMMERS

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INTRODUCTION

Since the index of coordination (IdC) was proposed (1), several studies using this tool have been conducted in adult and/or elite swimmers. However, studies regarding the coordinative assessment in age-group swimmers are scarce. Hence, as young swimmers are involved in systematic training since early ages, it is important to report specific information about the effectiveness of motor organization in these ages, as well as to characterize their general biomechanical parameters.

METHODS

Twenty-two female swimmers, divided in two age-groups (G1: infant, n=12 and G2: juvenile, n=10), performed 25m front crawl at imposed 50m race pace. One sagittal and one frontal cameras registered two complete under water upper limb cycles for biomechanical analysis using APASystem (manually digitalized frame by frame, at 50 Hz). The IdC was calculated according to Chollet et al. (1) and velocity (v), stroke frequency (SF), stroke length (SL) and stroke index (SI) were obtained thought the video analysis. An independent sample t-test was used.

RESULTS

Regarding physical and training background characteristics, differences were found in age (G1: 11.0±0.0 vs. G2: 13.6±0.7 years), weight (G1: 40.9±6.7 vs. G2: 51.1±6.9kg), height (G1: 1.5±0.1 vs. G2: 1.6±0.1m), arm span (G1: 1.5±0.1 vs. G2: 1.6±0.1m) and years of practice (G1: 3.3±1.1 vs. G2: 8.7±2.6). Regarding biomechanical parameters, the juvenile swimmers were faster (G1: 1.27±0.11 vs. G2: 1.62±0.06m·s^{-1}), showed a higher SL (G1: 1.57±0.19 vs. G2: 1.90±0.18m) and, consequently, higher SI (G1: 2.0±0.3 vs. G2: 3.1±0.4m^2.s^{-1}). SF (G1: 49.0±6.8 vs. G2: 51.4±3.9cycles·min^{-1}) and IdC (G1: -9.2±3.6 vs. G2: -7.3±3.2%) presented similar values in both groups.

DISCUSSION

It seems that the higher swimming experience of G2 allowed them to have better technique, as they showed the ability to move at a given velocity with the fewest number of strokes (SI). Related to this result, higher v and SL values were observed in G2. However, juvenile swimmers also exhibited higher height and arm span, which lead to a greater SL. Regarding IdC, it was not observed differences between groups, although juvenile swimmers showed slightly higher values. However, this difference was not sufficient to change coordination pattern, probably because both groups neither reached the speed threshold (1.8m·s^{-1}) nor the critical SF (50cycles·min^{-1}) (2,3) to which coordination mode change to opposition (remaining in catch-up coordination).

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Poster

EFFECTS OF A MANIPULATION L4/L5 ON ELECTROMYOGRAPHIC ACTIVITY OF THE QUADRICEPS MUSCLES DURING DYNAMIC TASKS

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INTRODUCTION

The aim of this study was to determinate the acute effects of a high-velocity low-amplitude thrust manipulation at L4/L5 level on electromyographic activity of the quadriceps muscles (vastusmedialis (VM) and vastuslateralis (VL)), especially, during dynamic tasks such as a squat and a vertical jump.

METHODS

A longitudinal randomized clinical trial was carried out where 42 sportspeople were divided into acontrol group (CG, n=21; 24.8 ± 5.4 years; 77.5 ± 10.0 kg; 180.0 ± 6.8 cm) and an experimentalgroup (EG, n=21; 23.0 ± 4.0 years; 77.3 ± 7.2 kg; 180.0 ± 5.7 cm).Previously to intervention, both groupswere subjected to assessment of electromyographic activity ofthe VM andVLof the right thighduring a maximum voluntary contraction (MVC), a squat and a vertical jump (pre-test). The electromyographic evaluation was done following the recommendationsof SENIAM[2]. Later (i.e., in a different day at pre-test), theEG submitted to a high-velocity low-amplitude thrust manipulation at L4/L5 level and the CG to a placebo technique. Both techniques were separated at post-test by 5 min of passive rest. Such post-test was realized following the same procedures than pre-test. The muscular activation was registered through a multi-channel surface electromyographic (Myotrace 400®, Noraxon U.S.A., INC.) from where were extractedthe variables of muscular activity relative to MVC and muscular activity and peak activity for two dynamic tasks analyzed. Respect to statistical analysis was realized a Wilcoxon test and a Mann–Whitney U test to determinate intra- and inter-group differences, respectively. The priori level of statistical significance was set at $p \leq 0.05$.

RESULTS

Non-statistically significant differences were found in any of analyzed variables to VM and VL between at pre- and post-test of both experimental and control groups. Similarly, there were no statistically significant differences between both groups at pre- and post-test.

DISCUSSION

According to the findings presented, a high-velocity low-amplitude thrust manipulation at L4/L5 level was almost as effective as a placebo technique in the modification of electromyographic activity patternsof the VM and VL. These findings are consistent with results found by Grindstaff TL et al. (2009)[1], who claimed that a lumbo-pelvic joint manipulationhad not an acute effect on electromiographic activity of the quadriceps muscles in subjects with a patellofemoral pain syndrome.

Consequently, a high-velocity low-amplitude thrust manipulation at L4/L5 level is not a useful technique to modify the electromyographic activity patterns of the quadriceps muscles and, more concretely, the activity of the vastusmedialis and vastuslateralis.

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INFLUENCE OF A STRENGTHENING PROGRAM ON THE HEAD POSITION IN STANDING AND SITTING POSITIONS

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INTRODUCTION

The inadequate head positioning is one of the most important risk factors for cervical injury (1). It frequently involvedan extensionatC0-C1 andC1-C2 level, a decrease of the middlecervical lordosis and an increase of the upper dorsal kyphosis (2). Such maladaptationsof the head positioning could probably be minimized through a specific exercise program. Consequently, the aim of this study was to evaluate the effects of a strengthening program on the head position in standing and sitting positions in comparison with a conventional physiotherapist treatment in injured cervical subjects.

METHODS

Thirty-six subjects with cervical injury, 25 women and 11 men, were randomlyassigned to an experimental group (EG, n=24) and a control group (CG, n=12). Subsequently, the head position of both groups was assessed through the measurement of sternal malar relationship (SMR) (2) in standing and sitting positions (pre-test). Then, the EG performed aconventional physiotherapist treatment (i.e. massage, stretching, thermotherapy and electrotherapy) and a daily specific exercise program, which consisted of 3 sets of 20 isometric cervical contractions, which should be maintained during 5 sec. Such program was performed during a 30-days period. By contrast, the CG only performed a conventional physiotherapist treatment. Finally, both groups were subjected to assessment of the head position (pos-test) following an identical procedure at pre-test. Respect to statistical analysis was realized a Wilcoxon test and a Mann-Whitney U test to determinate intra- and inter-group differences, respectively. The priori level of statistical significance was set at $p \leq 0.05$.

RESULTS

Both groups showed statistical significant differences in the SMR analyzed in standing and sitting position between pre- and post-test. However, a greater change in the head position in sitting was observed in the EG (9.88 mm) in comparison (5.08 mm) with CG at post-test. Similarly, at pos-test, the EG (7.96 mm) also presented a greater change in the head position in standing position than CG (2.83 mm).

DISCUSSION

The conventional physiotherapist treatment improved significantly the head positioning. Moreover, the performance of the proposed exercise program combined with a conventional physiotherapist treatment improved more significantly the head position than an isolated conventional physiotherapist treatment. Therefore, the performance of this strengthening program is a useful method to improve head positioning, which could increase the effectivenessof the treatment after a cervical injury.

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Poster

NEUROMUSCULAR INTERLIMB COORDINATION RESPONSES TO A HIGH VOLUME RESISTANCE EXERCISE ON BICEPS BRACHII USING TENSIOMIOGRAPHY

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INTRODUCTION

Tensiomyography (TMG) has been used to assess the contractile capacity of biceps brachii significantly varied by means of the effects of potentiation and fatigue mechanisms that take place at different exercise of curl-biceps phases (1). Rodríguez-Ruiz et al. (3) showed that TMG is highly useful for the evaluation of muscle stiffness and balance between muscle structures.

METHODS

Thirteen healthy moderately active subjects (age 25.1 ± 2.6 years; body mass 79.9 ± 8.9 kg; height ± 7.4 cm), accustomed to strength trainingand right handed, volunteered to participate in the study. They performed a curl-biceps exercise with a barbell: 8x15x10 kg. with 1 min. of rest. TMG was used to measurethe mechanical properties of muscle response such as maximum radial displacement of muscle belly (Dm), contraction time (Tc) and delay time (Td) in the recovery period, at the end of each setand in the 3, 6, 10 and 15 min. of the recovery time.

RESULTS

The results show a difference behavior between right and left arms in different phases of the exercise for activation and contraction time. Td indicates always a less values for right arm with significant statistical differences in Set 3 and 5 ($P< 0.05$). Tc shows a more complex behavior: Set1-3 right arm shows a higher value than left limb, Set4-7 indicates less high values than right arm and Set1 and 4 are significant statistical difference ($P< 0.05$). Dm for the right arm shows a downward trend in values while the left arm shows a wavy behavior ($P< 0.05$). In the recovery period the values of the right arm are lower than left arm and keeping all parameters the same behavior.

DISCUSSION

The results of Td and Dm in the right arm respond to the effect of post-activation potentiation enunciated by García-Manso et al (1) but the left arm have a different response, with values maintained throughout the series, fact that shows a functional asymmetry in sport specific movements (3), which are maintained in the recovery period. Therefore, Tc shows a wavy behavior in both limbs due to the process of adaptation to muscle fatigue during exercise performance and recovery time (2).

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EFFECTS OF MECHANICAL FATIGUE TO A RESISTANCE EXERCISE ON THE BICEPS BRACHII USING TENSIOMYOGRAPHY

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INTRODUCTION

Tensiomyography (TMG) could probably offer an interesting alternative for analyzing the effects of fatigue on muscle response. Specific alterations in muscle mechanical response have been associated by means of this methodology with increases in maximum radial displacement of the muscle belly (Dm), sustained contraction time (Ts) and relaxation time (Tr) (1).

METHODS

Thirteen healthy moderately active subjects (age 25.1 ± 2.6 years; body mass 79.9 ± 8.9 kg; height ± 7.4 cm), accustomed to strength trainingand right handed, volunteered to participate in the study. They performed a curl-biceps exercise with a barbell: 8x15x10 kg. with 1 min. of rest. TMG was used to measurethe mechanical properties of muscle response such as maximum radial displacement of muscle belly (Dm), sustainedcontraction time (Ts) andrelaxation time (Tr) in the recovery period, at the end of each setand in the 3, 6, 10 and 15 min. of the recovery time.

RESULTS

The results show a difference behavior between right and left limbs in different phases of the exercise related to fatigue. Tr indicates always less values for right arm in Set 1-8. Ts manifest the same behavior as Tr in Set 1-8 while in the recuperation period Ts behaves in a different way. Dm for the right arm shows a downward trend in values while the left arm displays a wavy behavior (Set 7, $P < 0.05$). The recuperation period in Ts shows that right arm values are higher than left arm while Tr behaves in a different manner with high values for the left limb.

DISCUSSION

Muscle belly (Dm) values show a downward trend that responds to increased stiffness shown by García-Manso et al (2), but the left arm responds differently depending on its level of requirement (3), showing the major differences between limbs in the last two series. This downward trend is maintained in Tr and Ts for the right arm but not for the left arm which tends to keep the values from the Set 3, albeit these differences between arms were not statistically significant. The recovery process is incomplete, with different adaptive responses for each arm and similar in Tr and Ts (1).

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Poster

ARE THERE DIFFERENCES IN MUSCLE CELL SWELLING BY INTENSITY TRAINING IN PARTIAL BLOOD FLOW OCCLUSION?

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INTRODUCTION

Occlusive strength training (OST) is a recent alternative method to improve the structural factors in skeletal muscle and strength(1, 2) and exist a relationship between the biological stress by OSTin the muscular cross-sectional area (3). However, we do not know the optimal intensity to induce acute cell swelling. It was suggested that low-intensity (20–30% of 1RM) combined with OST is the most appropriate to elicit muscle hypertrophy (3). The objective has been to compare the acute responses in muscle perimeterof different intensities in OST.

METHODS

Ten trained male subjects (21±1.3 years) were recruited in the two OSTprotocols30% and 70% of 1RM respectively. The same exercise wasperformedin both protocols: unilateral elbow flexion exercise; 3 sets until muscular failure; cadence was 2:2;resting 1 minute between sets; the pressure of OST was 130% of systolic blood pressure. Changes in the biceps perimeter (BP), muscle percentage (%) and the water percentage were evaluated by anthropometric tape and bioelectrical impedance respectively.

RESULTS

BPincreased after a 30% load (34.16 ± 0.95 cm) and a 70% load (34.06 ± 0.93 cm) regarding the pre-exercise value (32.6 ± 0.90 cm) in a significant way ($p \leq 0.001$). The amount of water increased in both protocols (baseline 5.04 ± 1.02 %; 30% 5.33 ± 1.26%; 70% 6.02 ± 1.53%), although these differences were not significant. Changes in the muscular percentage were not found after both protocols.

DISCUSSION

OST with loads of 30% and 70% of 1RM produces acuteincrease in thebiceps perimeter.

However, in a long-term effects (4) OST in combination with high intensity resistance training (80% 1RM), no differences were found in quadriceps hypertrophyin comparison to non-restricted (4). In our study we can find differences in the BPvalue with both protocols attributable to muscle cellswelling. Since there have appeared hypotheses establishing that this increase in muscular cell swelling could be an important factor for themuscle growth and muscular development (2, 3) muscle ultrasounds images will be used in the following study by the research group, to quantify the changes associated to the different occlusion training protocols.

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DEFINITION OF SCALE PARAMETERS FOR TRAINING ZONES IN FITWALKING MODALITY

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INTRODUCTION

The purpose of the study is to show the work that goes with the observation of individuals practicing sports. Specifically, we analyzed active individuals in gyms and in places where this activity can be done, either individually, or in groups. We tried to explain through analysis of heart rate (HR), with support from the Karvonen formula, the elliptical, and the variation between genders and age based on the Borg scale.

METHODS

the evaluation of this study was performed by analysis of several gym athletes Coimbra Fisicamente Health Club, in Fafe Ginásio Vital, the Oliveira do Bairro Corpo Louco, from Póvoa de Varzim, the Sportspirit. The universe of this sample resulted in 62 athletes, 31 were male and 31 were female, with a mean interval of 28 years in the ages which were subject to the five training zones (TZ) for the elliptical, with time periods varying between 20 to 40 minutes . Technical subjects related to each training zone, recovery, aerobic training, strength training, intensive training and competition.

RESULTS

Although there are significant differences in effect with respect to gender and age, in most cases there was compliance of locations. It was observed that the intergroup mean difference in loads where (HR) proved higher, for the training zones (TZ) where the cargo belonged 75-90 % intensity. There was a (HR) average 132.78 bpm in training (ZT) recovery area for (ZT) to aerobic (HR) average was 149.47 bpm, strength training will indicate a 159.11 bpm HR and training intensive features a 169.07 bpm HR and finally the (ZT) competition indicates an average value of 185.30 bpm.

DISCUSSION

Results in this research support the conclusion that the differences (ZT) and respective (HR) in the athletes in the study, the relationship between gender and the influence of age have a peculiar factor of the performance condition. The ACSM (2001) adopts the option of run and step, with the advantage of acquiring results, without the need to leave home. However, by adhering to this type of physical training the results will be identical when improving physical condition.

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Poster

PRACTICE OF PHYSICAL ACTIVITY AS A PSYCHOLOGICAL ENHANCER FACTOR VARIABLES AND SCHOOL PERFORMANCE IN STUDENTS OF 1ST CYCLE

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INTRODUCTION

Nowadays, the practice of physical activity has great influence in the quality of life.

Research in this area has demonstrated the benefits of physical activity, not only in the prevention of diseases, but also in growth stimulation and children development (Ahmed & Lima, 2008). School performance and psychological variables of self-esteem and self-concept are related to physical activity and step body mass index, and the multifaceted self-concept, including the areas of scholastic competence, social acceptance, athletic competence, physical appearance and behavior. The study of psychological variables has demonstrated that the physical, psychological and social well-being of the child (Faria, 2005) influencing their development and learning.

METHODS

The sample of our study consisted of 531 students of the First Cycle of Basic Education of the Portuguese State Public Education, of both genders (295 males and 236 females), aged between 8 and 10 years, with an average age of 9.13 years. To collect data, we used a grid of systematic recording of student achievement in the subjects of mathematics, English language and study of the environment. Also, we used the Self Concept Scale Susan Harter validated for the Portuguese population (Martins, Peixoto, Woods & Miller, 1995).

Data analysis was performed using SPSS 20.0 software using proof-factor ANOVA with post hoc test and linear correlation coefficient of Pearson.

RESULTS

Results show there was a gradual increase in the influence of hours of weekly physical activity practiced in children's self-concept level and overall school performance. There are positive, but not significant, differences in the level of self-esteem. Also, the higher the values of self-concept and academic achievement the lower BMI is.

DISCUSSION

The results indicate that there is a tendency towards increased levels of self-concept with increasing hours of practice weekly physical activity (Batista & Cube 2013). There was a close relationship between self-concept and physical activity (Faria, 2005).

CONCLUSIONS

Physical activity proved to be a significant mean of evolution in self-concept and student achievement, revealing even as a positive modeling self-esteem agent.

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PRE-COMPETITIVE AND COMPETITIVE ANXIETY LEVELS IN HOCKEY

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INTRODUCTION

This study results from a collection of data to evaluate and measure the trait anxiety and state anxiety in competition before a team competition Hockey. Assess trait anxiety in competition with the fact that the match is held at "home" or "out" and anxiety pre-competitive status of athletes.

METHODS

The sample consisted of 11 players from the senior team Hockey Skates Club "Os Tigres" de Almeirim. Two types of questionnaires were used in two different situations of confrontation and situation sports training. In practice situation that is before a competition the data on pre-competitive anxiety were recorded through the CSAI 2, which is divided into 3 areas: somatic anxiety, cognitive anxiety and level of confidence.

RESULTS

In somatic anxiety it was found results = 15.7 Low Anxiety. In Cognitive anxiety it was found results = 21.7 Average Anxiety. Level of confidence, it was found results = 32.8 High Anxiety. In a situation of anxiety about sports showdown SCAT was used, registering values at Game Out Vs Benfica game: The players have an average of 18.72, which equates to an average level of anxiety; Home Game Vs FC Porto: The players have an average of 25.09, which equates to a level of Medium High Anxiety.

DISCUSSION

Bray (1999) demonstrated that local competition may interfere with state anxiety of athletes, or more precisely, that competition "away from home" seems to raise the anxiety level of the athletes. However, our results are similar to the study of Martens et al. (1990), according to which, by the repetition of experiences for athletes, there is reduced state of anxiety intensity proportional to the increase in time so experience, Ferreira (2006).

CONCLUSIONS

Our study concluded that in the week before the game, the athletes had a low level of somatic anxiety, cognitive anxiety in middle level and high levels of self-confidence level. Competition in average anxiety levels were determined in the game "out" on the Sport Lisboa e Benfica and high average levels of anxiety in the game at "home" before the FC Porto.

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Poster

LOWER LIMBS NEUROMUSCULAR ASYMETRIES IN FEMALE BASKETBALL PLAYERS

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INTRODUCTION

Neuromuscular asymmetries of lower limbs are identified by the Symmetry Index (SI), which is considered a risk factor of injury, being the weakest leg the most exposed to injuries (1).

This imbalance between limbs is far more frequently seen in adolescent female athletes regarding strength, agility and postural control (2). The present study aims to assess these differences in terms of power, change of direction and balance capacities in young elite basketball players.

METHODS

Young female basketball players (from elite division, n=29) with no injury participated in this study (age: 15.66 ± 1.34 years; body mass: 69.69 ± 10.18 kg; height: 1.82 ± 0.07 m; sport experience: 6.31 ± 1.73 years).

The Single Leg Countermovement Jump in vertical (SLVMCJ), horizontal (SLHCMJ) and lateral (SLLCMJ) direction were tested, as well as the Star Excursion Balance Test (SEBT) and a sprint test with Change of Direction (COD). SI (% of performance difference between legs) was analyzed comparing the most and least skillful lower limbs (Figure 1).

RESULTS

Significant differences between legs were found in all the studied variables, with a SI of 14.11% (SLVCMJ), 3.86% (SLHCMJ), 3.33% (SLLCMJ), 1.71% (COD) and 2.57% (SEBT) (Table 1).

DISCUSSION

The main finding of this study was the significant difference in balance, change of direction and power between legs in young female basketball players. These results can be explained by specific sport actions as jumping and changing direction, probably leading to the development of asymmetric neuromuscular adaptations in the lower limbs. Similar results were previously found in some studies (3, 4), although others did not show significant differences (1, 5), probably because of different characteristics among samples (level of training, sport, age or gender). The registered SI magnitude varies among tests, showing the need of collecting data of different physical capacities independently. The results of this study show physiological values of SI for different specific functional test in young female basketball players. These values can be used as quantitative tools to optimize injury prevention strategies and return to play processes.

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NEUROMUSCULAR BASIS OF INSTABILITY TRAINING WITH T-BOW

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INTRODUCTION

The T-BOW is a curved training and therapy tool. Supporting loads over 350 kg, is it 70x50x15 cm and weighs 3.2 kg. Both elastic and reactive, it is useable on both sides and has narrow flat edges on its concave surface (1).

METHOD

Analysis of practical experiences and selective neuromuscular research comparing the T-BOW with other unstable devices (2).

RESULTS

Deadlifts performed on the T-BOW produced larger levels of strength and paraspinal muscle activity than those performed on a much softer tool like the Bosu. A lower-limb training program in healthy elderly women using the T-BOW device showed significant improvements in static balance, dynamic balance and overall balance (3). The spinal stretch reflex responses created by the narrow, ever changing angle of foot support while balancing on the T-BOW show the specificity and outstanding interaction of all interoceptive and exteroceptive sensations for control and regulation of movement. The remarkable reactivity of the T-BOW is very effective for improving balance in hard surfaces where many indoor and outdoor sports are practiced. The support on a flat surface demands less bilateral control and less rapid adjustment than on a curved, rounded and narrow-edged surface like the T-BOW; where a faster change of lateral foot control is required. This increased bilateral control potentiates intra and inter-muscular static-dynamic relaxation with advanced levels of segmental independence; all of which are relevant to activities and sports practiced on uneven and varied-design surfaces. In the basic unstable position of the T-BOW there is one axis causing movement instability. This is beneficial in creating very basic levels of imbalance that are already a challenge for many people. You can also spin (rotation in the vertical axis) and thus have two axes of imbalance during this action. If necessary you can use two T-BOW's (convex sides in contact) to have two constant axes of imbalance.

DISCUSSION

Before designing any training with unstable devices, one should carefully analyze the following criteria: 1) The level of static-dynamic reactivity of the device and training surface. 2) The conditions of support for each body part. 3) The axis of instability and the range of imbalance. 4) How slippery is the contact between the device and body. The T-BOW provides numerous options for effective instability training, for coordination and conditioning optimization, in fitness and sports performance.

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Poster

SOMATOTYPE, BODY COMPOSITION AND MATURITY STATUS COMPARISON OF YOUNG MALE SPRINT AND SLALOM KAYAKERS

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INTRODUCTION

Elite paddlers possess special characteristics such as high lean body composition, large upper body girths and breadths, low measures of adiposity, prevalence of mesomorphy and homogeneity in shape and physical size (1). But differences between sprint and slalom disciplines only have been studied in young women kayakers (2). The aim of this study was to compare somatotype, body fat percentage and maturity status between young male sprint and slalom kayakers.

METHODS

Sixty six young elite male sprint (n = 23; 13.69 ± 0.64 years old) and slalom (n = 23; 13.80 ± 0.55 years old) paddlers were measured using a complete battery of 26 anthropometric dimensions (4 basic measures, 7 girths, 7 breadths and 8 skinfolds).

They were selected by the Royal Spanish Canoeing Federation as the best in their categories to participate in two consecutive Annual National Development Camps. The equations of Carter and Heath (3) were used to calculate anthropometric somatotypes. Body fat percentage was calculated using Slaughter's formulae (4). Maturity status was estimated following the procedures of Mirwald et al. (5) to determine the time to/from the age of peak height velocity as an indicator of somatic maturity during adolescence. An independent t-test was conducted to examine differences between groups.

RESULTS

Mean somatotypes of both sprint and slalom paddlers were very similar, although sprint paddlers were best described as balanced mesomorphs (2.8-4.8-2.9), while canoeists were ecto-mesomorphs (2.4-4.6-3.1). Body fat percentage was higher in sprint (16.67 ± 5.45) than slalom (13.51 ± 4.55%) kayakers ($p < 0.05$). Furthermore, a greater maturity status was showed in the sprint paddlers group (sprint = 0.48 ± 0.74 years; slalom = -0.38 ± 0.88; $p < 0.01$).

DISCUSSION

Somatotypes were similar in sprint and slalom disciplines, where the mesomorphy was clearly dominant. The differences in body fat percentage and maturity status are in concordance with the result found in female paddlers (2). The data provided in this study could be used as a guideline for talent identification in sprint and slalom male kayakers.

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Poster

EFFECT OF SURFACE STIFFNESS ON CORTICOSPINAL EXCITABILITY DURING STRETCH-SHORTENING CYCLE (SSC) MOVEMENTS

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INTRODUCTION

Is currently accepted that adaptation of both preprogrammed voluntary activity as well as feedback mediated reflex activity contribute to stiffness control in SSC movements (Taube et al., 2012). However, little is known how the central nervous system (CNS) can adapt the initial motor command to allow a drastic change in the surface stiffness during a locomotor activity such as jumping. The current study therefore aimed to compare corticospinal excitability when changing from solid to elastic ground during a SSC-like movement.

METHODS

Ten healthy subjects were instructed to perform two-legged hopping at 2.2 Hz on two surfaces that differed with respect to their stiffness (~35.000 $kN \cdot m^{-1}$ vs. 60 $kN \cdot m^{-1}$). During hopping in this two different conditions, transcranial magnetic stimulation (TMS) was applied over the contralateral primary motor cortex (M1) of the leg area using a double cone coil secured to the head through a custom made helmet. Motor evoked potentials (MEPs) and background EMG (bEMG) of the soleus of the right leg were recorded during hopping at distinct time intervals after ground contact: at the time of the short latency response (SLR, 45ms), the medium latency response (MLR, 70) and the long latency response (LLR, 120ms). A two-way repeated measures ANOVA were performed with surface (elastic or stiff) and stimulation point (SLR, MLR and LLR) as factors for the MEPs size (% of bEMG). The alpha level was set at $p \leq 0.05$.

RESULTS

SOL MEP size was generally higher (surface factor: $p < 0.05$) during hopping on the elastic surface than on the stiff one although the background EMG was similar.

METHODS

Present study showed that corticospinal excitability was increased on the elastic surface in general. In part this may be due to the loss of efficacy of spinal reflex responses on elastic ground so that supraspinal centers had to compensate the loss of reflex contribution (argumentation in line with Moritz and Farley 2005). However, the higher postural challenges on the elastic surfaces may have also demanded stronger supraspinal involvement.

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Poster

EFFECT OF SURFACE STIFFNESS ON THE H-REFLEX RECRUITMENT CURVE DURING STRETCH-SHORTENING CYCLE (SSC) MOVEMENTS

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INTRODUCTION

For everyday locomotion, neural control of leg stiffness may be particularly important when changes in the support surface occur. It is accepted that leg stiffness (K_{leg}) increases when surface stiffness decreases, and vice versa (Ferris and Farley, 1997). However, little is known how the central nervous system fulfills this task. To understand the effect of surface stiffness on the neural control of stretch-shortening cycle movements, this study aimed to compare modulation of H-reflex at distinct phases after ground contact during two-legged hopping when changing from solid to elastic ground.

METHODS

In six subjects, H-reflex recruitment curves were elicited at the time of the short (SLR)-, medium (MLR)-, and long (LLR)-latency responses of the soleus muscle (SOL) during two-legged hopping on different stiffness surfaces, elastic and stiff. Electrical stimulation of the posterior tibial nerve was randomly applied at SLR, MLR and LLR. The stimulation intensity was adjusted in steps of 10% of the maximal M response recorded during upright stance, beginning from the H-reflex threshold until 110% of Mmax (in accordance with Zehr et al., 2002). A two-way repeated measures ANOVA were performed with surface (elastic or stiff) and stimulation point (SLR, MLR and LLR) as factors for the H-M ratio. The alpha level was set at $p \leq 0.05$.

RESULTS

SOL H-reflexes during hopping on the elastic surface were lower at SLR and larger at LLR than on the stiff surface ($p < 0.05$ for both comparisons), without any changes in the MLR.

METHODS

It is argued that this phase-specific adaptation in spinal reflex excitability is functionally relevant to adjust leg stiffness to optimally exploit the properties of the elastic surface. It may be speculated that on elastic floor, changes at the spinal level may have reduced stretch-induced activity at the time of the SLR.

In this sense, several SSC studies have provided indication that gating of spinal reflex circuits at the time of the SLR is preprogrammed, probably by presynaptic inhibition (Leukel et al. 2008; Taube et al. 2012). In contrast, the latency of the LLR response corresponded to the latency where the subject-surface system was maximally compressed (±120 ms). It may therefore be assumed that enhanced reflex contributions may have been important to resist potential further muscle lengthening by increasing the stiffness (Nichols & Houk 1972) at the time of maximal compression.

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HEMATOLOGICAL RESPONSES OF DIAPHRAGMATIC ASPIRATION IN SPLENECTOMIZED SUBJECT. CASE STUDY

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INTRODUCTION

Diaphragmatic aspiration thecnique associated with expiratory apnea (1), popularly called Hypopressive Thecnique (HT), has few references in the literature.

HT effects on blood values are yet unknown. The aim of this work was to study the effects of HT on blood changes of splenectomized (whose spleen has been surgically removed) man, taking into account the erythroclasis role played by the spleen in human body and oxygen desaturation.

METHODS

Physical active splenectomized man (40 years old) with prior knowledge of HT execution performed three sessions of thirty minutes on alternative days. Training consisted of 120 seconds expiratory apneas on inversion table placed at 45º, with rests of 60 seconds on horizontal table position. Oxygen saturation (SpO_2) was measured with pulse oximetry (model 50F). Blood analysis was performed on medical laboratory, assessing hemogram (hematocrit, hemoglobin, erythrocytes) and leukocyte formula before each training.

RESULTS

There were no changes in any of the hematological parameters studied ($p>0.05$). SpO_2 achieved 75,9% average during training.

DISCUSSION

Results of the present case study show there were no changes in blood levels over a week of training with HT. Increased hematocrit attributable to splenic contraction accompanies human apnea (2). Probably, this increase was not given being a splenectomized case. A comparative study with divers and splenectomized who hold repeated subacuatic apneas (3), demonstrated active contraction of the spleen in response to breath-hold apnea. SpO_2 recorded during HT training showed desaturation below 80%. Similar results were provided by a research with professional divers who obtained decreased SpO_2 during repeated apneas of 60 seconds (4). No changes in blood parameters were observed after exposure to HT training in a case of splenectomized physical active man. More research is required to determine whether the lack of spleen may influence these values.

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Poster

FITNESS LEVEL DETERMINES THE EFFECTS OF A BOUT OF INTENSE AEROBIC EXERCISE TO EXHAUSTION ON ATTENTIONAL PERFORMANCE

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INTRODUCTION

Recent years have seen a growing interest in the study of the influence of acute exercise over cognitive processing (McMorris, Tomporowski, & Audiffren, 2009, for a review). In this line, it is important to note that physical fitness plays an important role on the effects of physical exercise on attentional performance (e.g., Etnier, Nowell, Landers, & Sibley, 2006).

METHOD AND DESIGN

Two groups of participants selected on the basis of their physical training habits and their physical fitness level according their VO_2 max. (high-fit, low-fit) performed an exogenous spatial attention task at rest and immediately after an incremental cycling exercise to exhaustion.

RESULTS

The results revealed that, after the intense bout of exercise, only the low-fit participants showed reduced (or even absent) attentional effects compared to the high-fit participants. The interaction between participants' fitness level and performance in the exogenous spatial task was only shown following intense exercise.

DISCUSSION

The reduction in exogenous spatial attention effects after an acute bout of effort was sensible to the physical fitness of participants. Our results are in keeping with those of previous studies revealing differences in attentional performance during and after short bouts of effort between participants with different physical fitness levels (see Brisswalter, 2002). In the present study, it would appear that an acute bout of exercise to exhaustion decreased the metabolic resources available for cognitive processing in low-fit participants compared to high-fit participants, and subsequently led to a decline in exogenous spatial attention effects. The results from the rest condition (without prior effort) seems to replicate the outcome of Lum et al.'s (2002) study who did not show any difference in performance in an exogenous spatial attention task at rest as a function of physical activity. In sum, the results presented here point to the crucial role of physical fitness level on the exogenous spatial attention while still under the influence of a previous bout of intense exercise.

ACKNOWLEDGEMENTS

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ASSESSMENT AND ADAPTED PEDAGOGY (SPECIALIZED WORKOUT PLAN) FOR RAMADANMUSLIM FASTING ATHLETES BASED ON NUTRITIONAL, BIOCHEMICAL AND HAEMATOLOGICAL STUDIES

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ABSTRACT

The main objective of this study is to assist sport coaches who face the problem of advising their athletes whether fasting and practicing intensive physical activities during the Islamic month of fasting (Ramadan) is safe. The second objective is to determine which of the four weeks of fast is the most critical for physical preparation of athletes and to have a clear idea on the time needed after Ramadan for these blood parameters to go back to their initial values. These parameters reflect the energetic status of the fasting athlete and consequently affect its performance. In most instances, however, the choice is left to the athlete. Fasting athletes who choose to fast during recuperation, training or competitions may therefore be at a disadvantage. Although this view is not entirely proved,but the lack of adequate scientific literature on this subject makes it difficult to precisely answer the questionon the effects on elite athletes competing in such specific challenging environments. Nevertheless, prolonged high temperature periods of training in the fasted state may not allow optimum one-month adaptation of muscles and other tissues. Opinions differ on just how much humans are affected by fasting. Research conducted to date shows relatively minor effects of Ramadan observance upon athletic performance, health or safety, though athletes must hydrate properly overnight and get sufficient sleep. After more than a decade of multiple studies on the adverse impact on fasting athletes of different physical activities had led to that the simplest ways to deal with this situation is to modify the athlete's training programme. Many training variables can be considered to improve or maintain exercise performance during the month of Ramadan such as: Warp-ups protocols, Adaptation specificity of each week of the fasting month, Training time of the day, FITT (i.e. frequency, intensity, time and type) with its specific hydration and nutrition together with the optimal sleeping. Coaches and athletic trainers are especially vigilant with fasting athletes and should adopt several strategies of the above mentioned variables to try to circumvent or reduce the adverse perturbations of Ramadan fasting. However, we conclude that Ramadan fasting is not only safe for practicing and even competing, but can be good for one's health and should be recommended for sedentary people in general and particularly for patients suffering from arteriosclerosis. These findings are not only useful for Muslims, but also for others throughout the world.

KEYWORDS

Athletes, intermittent Ramadan fasting, adapted pedagogy, performance.

Poster

COMPARISON OF HEART RATE AND PERCEIVED EXERTION IN WOMEN PRACTITIONERS OF ZUMBA® ACTIVITY

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INTRODUCTION

In recent years, collective activities associated with cardiovascular conditioning are having great demand, where Zumba® Fitness is included (1). This activity combinesaerobic exercises with steps of different Latin dances like Samba, Merengue and Salsa (2). Our Objective is to observe the correlation between heart rate (HR) and rateperceived exertion (RPE) according to the Borg scale in healthy subjects with no pathology and practitioners of Zumba®.

METHODS

30 women aged 30 ± 14 years took part in the study, all of themmonitored with heart rate monitors (Suunto Team Pod), using Borg Scale (0 to 10, where 10 was the most effort perceived) to determine RPE. PAR- Q questionnaire and a questionnaire about their physical activity habits were included. Also anthropometric characteristics: height, weight, % Fat and BMI was measured, HRmax was calculated by the formula provided by Gellish et al. During the sessions Average HR and HRmaxat15-30-45 minutes were recorded also RPE was recorded at same time.

RESULTS

The percentage of the average FC at 15-30-45 minutes was moderate to high intensity (75.67 % FC1, FC2 74.53 %, 71.87 % FC3; FCG 74.2 %). The % FC at the time of the marks 1 (15 min) and 2 (30 min) were vigorous (FC1 79.17 %, 81.77 % FC2, FC3: 72.3 %). The predominant RPE was lower, except for the second group corresponding to something hard on the Borg scale (RPE1: 3.87; RPE2: 4.47; RPE3: 3.4, RPEsesión: 3.9). No significant correlation between HR and RPE in any of the brands was observed.

DISCUSSION

In this study no significant correlation between HR and RPE in the activity of Zumba® was obtained, to healthy subjects without any disease, so, in this study, RPE is not an appropriate tool. The fact that we cannot conclude about big differences between the HR data and Borg scale, and according to the existing literature wouldbe because the social and motivational natureof the activity.

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Poster

HEART RATE RECOVERY IN ELITE BEACH VOLLEYBALL MALE PLAYERS: A CASE STUDY

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INTRODUCCION

Literature has studied and determined the ranges of heart rate during an actual match in both, team sports (1) and individual sports (2).The objective of this study is to identify those areas of heart rate that work during rest periods, and the time between points to know their recovery (time).

METHODS

A professional beach volleyball Olympic team was monitored in international competition with Polar Team II in online mode. We synchronize the video of the HR and the video of the match for analysis with Sportcode v.8.5.2 software. They were taken heart rate values player per second, with a total of 1h 57min and 36 seconds analysed. Athletes have a test of continuous effort for determining HRmax.

RESULTS

Player one in the time between points recorded a range of values of 77 and 89% HRmax. During technicaltime out he had an average recovery of 50±9 bpm, in time out 44±12bpm and set in late 56±18bpm. Player two presentsin the time between points HRmax valuesbetween 71 and 82%. During the technical time out had a recovery average of 46±12bpm, in time out of 52±10 ppm and in late set of 38±13ppm. Player one requiresfrom a meanof 12±1.41 seconds to start reducing his pulse after finishing one point, while player two needs an average of 14±2.83 seconds.

DISCUSSION

The heart rate values obtained during the determination of the periods of rest and theperiods between points show that athletes are most of the time of those periods in the metabolic aerobic zone between thresholds. Compared with other studies in volleyball players (3), beach volleyball players have values of more highheart rate during rest periods, this indicates the increased load and intensity in wich beach volleyball players work. Also, we can determine that beach volleyball players requireanmean of 13±1.41 seconds to begin to lower their heart rate after a point.

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Poster

EFFECT OF HIGH-FREQUENCY WHOLE BODY VIBRATION ON LACTATE REMOVAL

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INTRODUCTION

Exercise recovery plays a key role on after a high intensity competitive event. In this sense, fast and reliable methods to accelerate the blood lactate [Lac] removal and reduce fatigue (1,2) are necessary when athletes are still in competition. Therefore, the aim of this study was to determine the effect of high frequency whole-body vibration (WBV) on the [Lac] removal in physically active young.

METHODS

Eight young (age 21 ± 2 years, VO_2max 62.7 ± 1.9 ml/kg/min^{-1}, [Lac] rest 1.1 ± 0.4 mmol·L^{-1}) were subjected to 3 maximal 400m races with 48 h in between. After each test, [Lac] removal was randomized: a) 20 min sitting rest (REST), b) dynamic squat on the vibration platform (S+V) (30Hz, 4mm), and c) dynamic squat on the platform without vibrations (S-V). Samples of [Lac] were taken at rest, post (0 min), 10 and 20 min after the test (Lactate Pro II, Japan). Heart rate (50-60% HR reserve) was monitored during the work on the platform with a telemetric system (Polar Team, Polar Electro, Finland). ANOVA for repeated measures was used to determine the normality of the data ($p < 0.05$). Furthermore, the effect size was also estimated (g adjusted of Hedges).

RESULTS

The results showed that the three methods were effective on removing [Lac] after a maximal test. The rate of removal of the S-V and S+V group with REST group, both squat groups showed significant [Lac] removal at 10 min (5.5 ± 1.9 and 6.3 ± 1.6 mmol·L^{-1}), and 20 min (10.5 ± 1.4 and 10.3 ± 1.1 mmol·L^{-1}), when comparing to the REST group. However, no significant differences were obtained when comparing the removal levels among the squat groups, and no significant differences in effect size between the two methods (5%) were observed.

DISCUSSION

To date, there is no data available on the literature indicating a significant reduction of lactate removal using low-frequency vibration (2-4). On the same line, this study points out that a high frequency whole-body vibration protocol do not seem to influence the ability of [Lac] removal in physically active subjects supporting previous existing results.

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ACUTE AND RESIDUAL EFFECT OF VIBRATION ON HAMSTRING FLEXIBILITY

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INTRODUCTION

The muscle injuries on the hamstrings are among the most common in team sports such as soccer, American football, and rugby (1). In this regard, it has been reported that reduced flexibility may be associated with muscle strain-related injuries (2). On the other hand, previous data indicate that a stretching program helps on reducing this type of injury (3). Moreover, the use of vibrations has proved effectiveness in increasing the hamstring flexibility in a short period of time (4). Therefore, the objective of this study was to determine both acute and residual effects of high frequency vibration on the hamstrings.

METHODS

Seventy one sports science students (age 21 ± 2.6 years, height 1.70 ± 8.4 m, weight 57 ± 9.4 kg , fat 24 ± 4.1%) were randomly allocated into three groups: a) control, b) static flexibility without vibration (F-V), and c) static flexibility with vibration (F+V). Both vibration groups performed the task on a platform (Excel Pro, Fitvibe, Belgium). The task consisted on 3 sets of 1 min with each leg. After 1 min rest, participants were asked to reach out to the feet with both hands. The vibration intensity was set at 40Hz and 4mm. The modified Seat and Reach test (S&Rm) was used to measure the lumbar and hamstring flexibility. A goniometer was placed on the angle of the coxofemoral articulation of the both legs. An ANOVA with repeated measures was applied, together with the Cohen effect size. The significance was set at $p< 0.05$.

RESULTS

The results indicate that both F-V and F+V groups significantly improved flexibility when compared to the control participants ($p< 0.0001$). The F+V group showed 1.86 cm increases in the S&Rm, and up to 1.76 cm in the coxofemural articulation when compared to the F-V. On the same way, F+V flexibility was less affected than F-V after 4 days after training (Cohen effect size).

DISCUSSION

In conclusion, an acute vibration session significantly improves hamstring flexibility and also generates an increased residual effect compared to F-V group. This supports the use of vibration as a tool to help on preventing injuries in athletes and physically active subjects.

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Poster

AUTONOMIC MODULATION IN AN ULTRAENDURANCE MOUNTAIN MARATHON

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INTRODUCTION

Previous research in ultraendurance events have been focused on the study of biological parameters. However, the autonomic modulation in this event has not been well studied. The purpose of this study was to analyze changes in autonomic modulation in an ultraendurance marathon.

METHODS

6 ultraendurance athletes (30.8±3.1 years; 176.2±8.6 cm; 69.2±3.7 kg) participated in the study. The subjects performed a 54 km race and the cumulative altitude change was 6441 m. The race time was 14 h and 6 min. Heart rate variability (HRV) and heart rate (HR) was recorded during the race. Basal HRV was measured while they slept 2 days before the race. HR recorded data were analyzed using a SUUNTO (Suunto Oy, Finland) HR monitor. HRV was analyzed with the software Kubios HRV (Univ Kuopio. Kuopio. Finland). The variables of time-domain was: HR, average NN(ms), SDNN(ms), SDSD(ms), PNN50(%) and RMSSD(ms). The data were analyzed with SPSS 17.0. Shapiro-Wilk normality test was used to check homogeneity and then Friedman test was realized. The level of significance was $p<0.05$.

RESULTS

Values in maximum HR was 173.7±11.0 bpm, minimum HR was 51±6.6 bpm and average HR was 111.7±5.9 bpm. The calculated HRmean/HRmax ratio was 0.6. The time in <50% HRmax was 232.2±12.3 min (27.6%), in 50-70% HRmax was 348.0±18.6 min (41.4%), in 70-90% HRmax was 231.5±11.2 min (27.5%) and in >90% HRmax was 28.3±9.3 min (3.5%). Average NN decreased from basal (591.8±67.3ms) to after the race values (490.0±46.3 ms). SDNN, SDSD and RMSSD decreased significantly ($p<0.05$) after the race (SDNN:835.3±96.8 to 206.2±60.2*ms; SDSD:159.6±32.5 to 31.6±11.6*ms; RMSSD:789.2±90.2 to 159.2±81.3*ms). Finally, pNN50 basal values were higher (48.3±21.2%) than after the race values (34.7±25.3%).

DISCUSSION

The results in HRV showed how parasympathetic activity decreased during the ultraendurance event, because of the values of pNN50 and RMSSD diminished (1). These results showed the high activation of the sympathetic nervous system, according to the high percentages of decrease found in SDNN, pNN50 and RMSSD variables. This increase in sympathetic activity has been described by other authors in periods of high training load (2); in contrast, a decrease in sympathetic activity was measured over periods of low training load or pre-competitive training periods[2]. The decrease in vagal modulation observed during the ultraendurance event and increase in sympathetic modulation showed that this type of effort is highly stressful for athletes. Due to this adaptations and physiological changes he performance may increase in this event. A possible explanation may be that this type of effort produces cardiac adaptations from modulation of autonomic nervous system (3).

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CENTRAL NERVOUS SYSTEM FATIGUE AFTER VO_2MAX TEST IN TRIATHLETES

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INTRODUCTION

Several authors have studied the influence of exercise on the nervous system and cognitive functioning in untrained subjects and different types of efforts using the Flicker Fusion Threshold (FFT). However, the effect on the central nervous system (CNS) of maximum aerobic stimuli is not well studied. The purpose of this study was to examine changes in FFT before and after perform an incremental VO_2max running test as a means to evaluate the CNS fatigue.

METHODS

9 male trained triathletes (26±6.7 years; 173.3±5.9 cm; 66.4±5.9 kg; VO_2max: 59.5±5.1 ml/kg/min) were tested in an incremental treadmill maximal running test (starting at 10 km/h during 5 min and with 1km/h increments every 1 min until complete fatigue). Before and after the maximal test the subject performed ascending and descending test, 3 times and average value was analysed. FFT ascendent (FFTa) and descendent (FFTd), the subjective test (ST) and sensory sensitivity (SS) was recorded by Lafayette Instrument Flicker Fusion Control Unit. The flicker frequency increment (2Hz/sec) changed in 2 ways: from 10 to 100 Hz and from 60 to 0 Hz in ascending and descending test respectively. Cortical Activation was measure through the Critical Flicker Fusion Thresholds (CFFT). The data were analyzed with SPSS 20.0 software. Shapiro-Wilk normality test was used to check homogeneity and then Friedman test was performed. The level of significance was $p<0.05$.

RESULTS

FFTa increased (2.2 %) from basal (35.2±2.3) to after the test (36±2.2). FFTd basal values were higher (0.2 %) than after the test (38.5±7.1 to 38.4±6.8). ST increased (74 %) after the VO_2max test (-3.2±6.9 to -2.4±6.1). Finally, CS decreased significantly ($p<0.01$) after the trial (36.8±3.9 to 35.3±2.1 or 4.2%).

DISCUSSION

The results showed no changes in CFFT, thus, there was not decrease in sensorial sensibility or increase in cortical activity. In this sense, the decrease in CFFT is related to fatigue of CNS and also to decrease in processing information. VO_2max test did not result in symptoms of fatigue in CNS in triathletes, as the results in CCFT showed. Therefore, the fatigue in this type of effort may due to muscle fatigue than CNS factors[2]. The significant decrease in CS values were not in accordance with the results obtained in stressful situation as VO_2max and submaximal test. SS values were maintained, according to the results obtained after a submaximal effort.

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Poster

PILATES EXERCISES IN ELITE BASKETBALL: A CASE STUDY

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INTRODUCTION

The Pilates Method is a set of exercises with the objective of correcting the posture of an athlete and a treatment method to help prevent injuries (1). The Pilates Method exercises are targeted to strengthen and tone the lumbar spine muscles, at the base of the spinal column (2).

CASE STUDY

An 18 year old professional basketball player, who plays for an ACB League team. All season long in 2012/13, he was suffering from regular pain in his lower back, hindering his performance in the sport and his confidence level in CASI- 2 (3) questionnaire was 55%. The Pilate's method will be applied two days a week for one hour using exercises to strengthen the abdominal core muscles: i) transversus abdominis, ii) major and minur oblique iii) spinal muscles. The treatment will be completely personalized during the first twenty matches in 2013/14 and the data obtained will be compared with the data obtained from the first twenty matches of the previous season.

OBJETIVE

Watching how the Pilates Method affects his sporting and emotional stability during the 2013/14 season.

RESULTS

The athlete has increased his percentages in the following sections: minutes (52.2%), points scored (36.79%), rebounds (72.5%), assists (61.77%) and finally he has improved his total value to 24.6% in a total of 19 matches (21.1%). On the other hand, the athlete shows a confidence level of 80% in the sports confidence inventory CASI-2.

CONCLUSIONS

The Pilates Method is a great complement at both a physical and mental level by preventing injuries sustained by the elite athlete, and by increasing their self-confidence.

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LEVEL OF EFFORT IN HIGH INTENSITY EXERCISES: RELATION BETWEEN METABOLIC AND PSYCHOLOGICAL RESPONSES

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INTRODUCTION

The intensity of the exercises along with the speed of execution is the main parameter to estimate the mechanical power output generated. Several studies have attempted to measure the intensity of effort through metabolic responses focusing on blood lactate and ammonia concentrations (1). Due to the difficulty involved in measuring, a scale of rating of perceived exertion has been validated (RPE) (Borg scale). This RPE scale gives us information about resistance exercise intensity (low intensity). Up to this moment only Laurent et al. (2) have used the RPE at submaximal sprint. Our aim is to correlate the RPE scale with acute effects in high intensity sprints.

METHODS

Eighteen high level sprinters (age 23.1 ± 4.4 yr, body mass 73.7 ± 4.6 kg, height 177.6 ± 5.9 cm; body fat 9.6 ± 2.9%) took part in this study. Three sessions of 40, 60 and 80m performed at highest speed possible up to lose 3% of speed with 4, 6 and 8 minutes rest between sets (same ratio work/recovery for different DT) separated by a week were performed. Psychologic (i.e. RPE) and metabolic responses (i.e. blood lactate and ammonia concentrations) were measured pre-exercise, during exercise each repetition performed and post-exercise.

RESULTS

RPE pre-post session were significant for all sprint workouts analyzed and highly correlated to metabolic responses (Lact-RPE40/60/80m r = 0.87, 0.81, 0.84) (Amn-RPE40/60/80m r = 0.83, 0.80, 0.82). A high relation between speed losses, distances and RPE responses during the successive sprints is observed. The fatigue, measured as RPE increment, is strongly correlated to lactate (r = 0.83 average), and ammonia (r = 0.82 average).

DISCUSSION

Different studies have observed that a relation between RPE and strength trainings (3) exists. The validity of this tool for measuring the effort level is backed by the high correlations found between psychological (RPE) and metabolic (lactate and ammonia) measures of fatigue to objectively quantify metabolic fatigue during sprint training. The results of this study show that, indicating or using the values of RPE in different moments or at the end of each serie, it is possible to monitor the intensity of successive sprints.

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Poster

INFLUENCE ON OUTCOMES OF PERCEIVED EXERTION IN SOCCER PLAYERS

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INTRODUCTION

To quantify and to keep track everything that happens in the practice is an essential way to know how athletes improve and if they are achieving objectives proposed. The perceived exertion, such as tests has been and is being used not only for sport. Many authors who have given validity to this tool to estimate how much load or fatigue that athletes have been undergo (1 & 2). Therefore, perceived exertion is increasingly used and there is little evidence on the continued use during long periods of time on high performance teams during competitions (3).

METODOLOGY

For this study, there are 20 subjects on a Spanish Third Division team, group XIII (24 ± 2 years). As an instrument, a modified scale of perceived exertion of 10 points given by (4). This psychophysical scale integrates perceptions about body and mind during the effort done before (2). The use of this instrument is based on filling a questionnaire just after each match played in a tab which relates the time played, player position and scale of effort that the player has received after completing the game (0 to 10). The scale was run for 8 matches of second round.

RESULTS

After statistical analysis, results provide that there was a greater perception of effort when the match has finished with a victory, which showed a total of 520.2 of average load. Finally, collected data that showed lower levels of load were lost matches, with an average of 513.3 of total load.

DISCUSSION

It should be noted that subjective perception of effort that athletes got was relative. It is probably that athletes attributed success to internal factors, when a victory may actually be due to a lack of skill or effort from adversary team. Likewise, they could attribute to external factors such as bad luck, when the team had lost the match (5).

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EVOLUTION OF THE RECORD TIME AMONG NEW YORK MARATHON MASTER-RUNNERS

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INTRODUCTION

Researchers have examined multiple aspect of marathon experience fromdifferent perspectives due to the increases in popularity of the major endurance running events.It has been reported that elite runners and top-50 New York marathon master-runners improved their performance over editions in both sexes(1, 2), however the evolution of the record time in master-runners has not been studied. The purpose of this study was to assess the evolution of best-time records among New York Marathon master-runners.

METHODS

The record time in age category (60-64, 65-69, 70-74 and 75-79 years) and sex of New York City Marathon runners from 1970 to 2013 were examined using linear regression analysis. Record time (*x*) was defined as dependent variable and edition (*y*) was determined as indepent variable in each sex and age category.

RESULTS

The regression equations in each age category in women and men respectively were: 60-64years,y = -11.107x + 296.55 (R^2 = 0.71) and y = -4.5253x + 208.92 (R^2 = 0.45); 65-69years, y = -8.5107x + 299.8 (R^2 = 0.83) and y = -7.4152x + 244.65 (R^2 = 0.60);70-74years,y = -9.2485x + 339.23(R^2 = 0.57) and y = -7.6476x + 264.65 (R^2 = 0.65); and 75-79years,y = -19.801x + 467.96 (R^2 = 0.88) and y = -4.04x + 284.4 (R^2 = 0.48).

DISCUSSION

The tendency to improve the record time among editions was not regular.Healthy people who continue to engage in habitual high intensity exercise attenuated the decline in $VO2_{max}$ (3, 4) and the longitudinal decrease in functional performance of elite marathon runners could be not linear due to the biological aging, change in exercise training regimen and injuries (5). Moreover, the major decrease in the record time between editions in women could be explain by the increment of popularity among them (6).

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Poster

EFFECTS OF RESISTANCE AND MULTICOMPONENT TRAINING ON THE RISK OF FALLS OF INSTITUTIONALIZED ELDERLY WOMEN

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INTRODUCTION

Falls are the major public health problem among older adults. The majority of injuries caused by falls leads to a high healthcare demand and expenses (1, 2). Therefore, reducing fall risk in older adults is an important public health issue. However, it seems that studies carried out with institutionalized elderly are less frequent. With this growing aging population, the number of individuals who are institutionalized, particularly elderly women, will increase in the coming year (3). The purpose of this study was to compare the effects of two short-term training programs on the risk of falls among institutionalized elderly women.

METHODS

Thirty-two elderly women (aged 72.9±6.6 years) living in home care institutions, were randomly assigned into a resistance training group (RTG, n=12), a multicomponent training group (MTG, n=10), and a control (n=10). All the participants performed the Timed Up & Go Test (TUG) and the Functional Reach Test (FRT), before and after training. Both training programs consisted of two weekly sessions during 12 weeks. The resistance training protocol included 7 exercises for the major muscle groups (60% to 85% of 1-RM). The multicomponent training protocol included aerobic exercise, muscular endurance, balance and flexibility exercises (moderate intensity, 12-13 points on the Borg Scale). One-way ANOVA with repeated measures was used to examine the effects of training programs.

RESULTS

ANOVA indicated a significant main effect of group ($p<0.000$) for TUG and FRT, with significant differences between both training groups and control. There were no differences between RTG and MTG. ANOVA also identified a significant main effect of Time*Group for TUG ($p=0.010$) and FRT ($p<0.001$) in both training groups. Significant differences were observed between pre- to post-test in the performance of the TUG ($p=0.014$) and FRT ($p<0.001$) for both training groups.

DISCUSSION

Data suggest that 12 weeks of multicomponent training was so effective in preventing falls among institutionalized elderly women, as resistance training. Further, multicomponent training demonstrated a wide practical applicability, and low cost development, unlike resistance training resources that need more expensive and complex logistics in such institutions.

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INFLUENCE OF INTRA-HOSPITAL EXERCISE PROGRAM IN OLDEST OLD IN FUNCTIONAL CAPACITY AND ADLS

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INTRODUCTION

To assess the potential beneficial effects of regular physical activity in oldest old people, included hospitalized ones,is of public health and clinical relevance.The negative effect of hospitalization on functional outcomes in population-based (1) and in-hospital cohort studies is well established (2). This impairment occurs even with short hospital stays (3,4). Loss of strength with bed rest can be 5% per day or more (5). Thus, it is not surprising that even short hospital stays might result in a decrease in functional capacity, including mainly the ability to perform activities of daily living (ADLs).

METHOD

This study is an ongoing intra-hospital randomized control trial. Patients aged 75 years or older admitted for a short hospital staysare randomly assigned to a control or intervention group. Participants in the control groupreceive normal hospital care whereas participants in the intervention group perform 2-3 sessions per day of lower limb strength training (standing from a seated position) and walking (10 min bouts) while hospitalized. The primary outcome is functional capacity pre- and post- hospitalization (upon discharge), as assessed with the Short Physical Performance Battery (SPPB). The secondary outcomes are assessed pre-hospitalization and 3 months after discharge and include: ability to perform ADLs (Katz ADL score), mortality and number of falls since discharge.

PRELIMINARY RESULTS

The intervention group (n=99, mean age 88y) had more fragility (63.3%) and falls (37.8%) than the control group (n=83, mean age 88y) at pre-hospitalization, yet the former showed a significant increasein functional capacity (SPPB score) at discharge that was not observed in the controls. The ability to perform ADLs (at the same level as before hospitalization) was regained at discharge in 51.5% of the participants in the intervention group (vs. 36.1% in the controls; $p<0.05$).

DISCUSSION

Anintra-hospital program that include strength and walk exercisecould contribute to regain faster the ability to perform ADLsin oldest old and frail people after hospitalization. These programs should beimplementedto maintain independence (6) in this population segment.

FINANCIAL SUPPORT

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Poster

OXIDATIVE STRESS RESPOSES TO A GRADED MAXIMAL TEST AFTER EXPLOSIVE RESISTANCE TRAINING IN THE ELDERLY

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INTRODUCTION

Even though physically active aged people benefit from exercise-induced adaptation in cellular antioxidant defense systems (Viña et al., 2013), age-related biochemical changes make them more susceptible to oxidative stress following intense exercise (Ji, 2001). In the present study, we aimed to evaluate the impact of explosive-type moderate-resistance training (EMRT) on oxidative stress biomarkers induced in the elderly by a single bout of acute-intense exercise.

METHODS

Sixteen older adults (70–75 years) were randomly assigned to either a control, not exercising group (n=8) or a trained group (n=8). The trained group performed a EMRT protocol 2 days per week for 12-weeks which consisted in upper and lower resistance exercises executed at 70% 1RM with the concentric and eccentric phases of the movement performed at maximal intentional acceleration and moderate speed, respectively. Participants were submitted to a cycling graded maximal exercise stress test (GXT) at baseline and following the 12-weeks of EMRT protocol, with blood samples collected before, immediately after, 1 and 24h post-GXT test. Blood glutathione (GSH, GSSG, GSH/GSSG), plasma malonaldehyde (MDA), protein carbonyls and creatine kinase (CK) levels, as well as PBMCs stress–protein response (Hsp70 and Hsp27 expression) were evaluated.

RESULTS

The use of multiple biomarkers allowed us to confirm that EMRT per se neither affected redox homeostasis nor induced any cellular and oxidative damage. Following the GXT, the EMRT group displayed a higher GSH/GSSG ratio and a less pronounced increase in MDA, protein carbonyls and CK levels compared to control group. Moreover, we found that Hsp70 and Hsp27proteins were induced after GXT only in EMRT group, while any significant modification within 24h was detected in untrained group. Apoptosis rates and DNA damage did not show any significant variation in relation to EMRT and/or GXT.

DISCUSSION

We recently demonstrated that EMRT (Beltran-Valls et all., 2013) is highly beneficial in elderly subjects towards muscle strength, power and functional capacity, with a systemic adaptive response of anti-oxidant and stress-induced markers at rest. With the present study we concluded that the adherence to an EMRT protocol is able to induce a cellular adaptation allowing healthy elderly trained subjects to cope with the oxidative stress induced by an acute exercise more effectively than the aged-matched sedentary subjects. Ji LL (2001) Ann N Y Acad Sci (2001) 928, 236–247. Viña J et al. (2014) Pharmacological properties of physical exercise in the elderly. Curr.Pharm.Des. 2013 Sep 27. Beltran Valls et al. (2014) Age (Dordr), Oct 18.

PREHABILITATIONIN PATIENTS UNDERGOING MASTECTOMY: A REVIEW OF THE LITERATURE AND DESIGN OF EXERCISE INTERVENTION

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INTRODUCTION

Breast cancer (BC) is the most common invasive cancer among women in the western societies. Mastectomy is the first treatment option in early-stage BC and is often associated with adverse effects that diminish quality of life, affecting the physical function and psychological well-being of the patient. Current BC treatment options consider not only the patient's survival, but also the rehabilitation process post-surgery. In this context, the concept of prehabilitation arises. Prehabilitation can be applied between the time of cancer diagnosis and the beginning of acute treatment (1) and it is focused in enhancing the functional capacity of the individual to better withstand the stress and adverse consequences of the surgery (2). Our aim was twofold: first, to review the literature to identify the exercise programs applied pre- and post-mastectomy and second, to design anexercise training protocol that may ensure the ideal conditions to better tolerate the mastectomy and reduce its adverse side effects.

METHODS

Studies that had some form of physical exercise undertaken prior and after surgery were included. The literature search was conducted on the following electronic bibliographic databases: PubMed, CINALH, Scopus and Cochrane Plus.

RESULTS

Our search revealed 81 studies, among which 20 potentially relevant studies were identified. Most of the studies were performed post-mastectomy (95%) and only one of them pre-intervention (5%). The studies post-intervention identified several adverse changes such as muscular atrophy, weight modifications and an important loss of strength, flexibility and aerobic capacity. However, the lack of information on the workload for resistance training was the main limitation for the analysis of the protocols (45% of the cases). We propose an intervention program which combines the three main lines proposed by the American College of Sports Medicine (3): aerobic training, resistance training and flexibility.

DISCUSSION

Mastectomy impairs the physical condition and leads to difficulties in daily life of patients. Most of the studies are focused on the rehabilitation post-surgery and the characterization of the programs used is sparse. We propose a prehabilitation program aimed to improve the physical condition of the patients pre-surgery, which could mitigate the impairment which occurs after mastectomy.

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Poster

INFLUENCE OF A STRENGTH TRAINING PROGRAM ON ROCKPORT TEST IN OLDER PEOPLE

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INTRODUCTION

Aging is defined as the progressive loss of organ function and intellectuals, accompanied by loss of fertility and increasing mortality with advancing age (1). The aging process combined with the lack of activity involves a detriment of the cardiovascular system, reducing its capacity, producing disuse atrophy and cell loss. This in turn is associated with decreased maximal oxygen consumption (VO_2max) between 10 to 24% from 30 years old causing a decrease in neuromuscular activity.

METHOD

Forty seven elderly people (19 men of 68,80±5,43 years old and 28 women of 69,18±4,27 years old) performed a strength training program for 13 weeks. Two experimental group (men and women) performed three sets of 6-12 reps of eleven resistance training (65-80% 1RM) 3 times per week for 13 weeks with 20-60 seconds rest between sets. RM and Rockport test were evaluated before and after the training program. Analysis of variance with repeated measures on the factors groups (EG and CG) and time (pre and post-test), followed by Bonferroni post hoc to identify potential intra and intergroup differences was used.

RESULTS

Although changes are observed in the time spent to complete the test and decrease the average heart rate, these changes are not significant. Only the experimental group of women obtains significant changes ($p<0,015$) in maximum oxygen consumption (VO_2max). The two experimental groups had improvements (60,08±28,84% for men; 54,29±38,16% for women) in RM test.

DISCUSSION

Strength training high intensities produces great improvements in muscle strength (2, 3). Is necessary to use very short rests periods for improvements in maximal oxygen consumption. Some studies recommend mixed training programs that address both the cardiorespiratory system and the neuromuscular capabilities to promote endurance and strength (3).

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Poster

RELATIONSHIP BETWEEN AEROBIC CAPACITY AND QUALITY OF LIFE THROUGH A FITNESS-EDUCATIVE PROGRAM IN OLDER WOMEN

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INTRODUCTION

World population in 2050 is going to increase nearly 2.000 million in the number of people over the age of 60 (1). Physical limitations can be lessened in elderly people through aerobic exercise (2). Hence, objective of present study was to observate relation between practice activities from educative program and healthly of physical condition with quality of life (QoL) and aerobic capacity of participates.

METHOD

Fourty three women over 60 years (mean age: 66.34 years, standard deviation: 5.26) participated in aerobic training (dance and choreography) and educative program (Malaga County Council) focused to health with a minimum of 3-years experience. The frecuency of class is twice per week with duration of 50 minutes each. Evaluation and data base followed international protocols stablished, aerobic capacity was evaluated by 6-minutes walk by Senior Fitness Test (3), QoL by SF-36 (4) and sociodemographic variables by specific questionnaire. Tau b of Kendall was used in order to analyse parametric and Non-parametric statistics such as the functional fitness with different domains of SF-36.

RESULTS

Results obtained on present study show significant relationship between correlation 6-min walk and four domain of SF-36: Physical functioning (Kendall´s tau b= 0.258, $P \leq 0.05$); Physical role limitation (Kendall´s tau b= 0.289, $P \leq 0.05$) and Bodily pain (Kendall´s tau b= 0.328, $P \leq 0.01$); General health perceptions (Kendall´s tau b= 0.328, $P \leq 0.01$).

DISCUSSION

The findings of present study indicate there is an association of 6-minutes walks test and the possible health status. The increase in performance by providing a fitness program (aerobic activities) is sensible, as reflects results of present study. Physical activity through aerobic exercises produces benefits on mental health of elderly women (5) and increases the QoL (6).

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Poster

ACUTE HOSPITALIZATION AND FUNCTIONAL RESISTANCE TRAINING: A PILOT STUDY

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SUMMARY

Acute hospitalization is characterized by long periods of physical inactivity. Older patients often experienced a functional decline at hospital admission and also during hospitalization (3). By the moment there is no evidence on the contribution of exercise during an acute hospitalization in functional independence maintenance(1). Maximum isometric strength determined by hand held dynamometry has been shown to be a reliable objective measure to obtain muscle force production in elderly and physically impaired subjects (2, 4).

The studycompares the effect ofdaily functionalresistance exercisewith habitual care during acute hospitalization on maximum isometric strength of upper and lower limbs; and also on the length of stay

METHODS

A Controlled Clinical pilot trialwith a functional resistance exercise group (EG) (n=14; 86±5years), and a control group (n=15; 85±5years) that received habitual care (HC) inthe lengthof acute hospitalization (AH). Maximum isometric strength of upper (arm curl) and lower limb (leg extension), was tested at admission and previous the discharge day with hand-held dynamometer. It was also determined the length and adverse events inacute hospital stay.

RESULTS

The maximum isometric strength (mean+SD from admission to discharge time) for the upper (18+9 kg to 19+12 kg; n=10), and lower limb (form 33+7 kg to 32+23 kg; n=3) for HC group, did not significantly changed during hospitalization. Similar non-significant results were obtained for EG (23+9 kg to 25+7 kg and 30+13 kg to 32+13kg) respectively; for the upper and lower limbs. Mean (SD) days length of stay at hospital were not statistically different between groups (p=1.000), 11(7) for HC and 10(5) for EG. There were not registered adverse events for EG group.

DISCUSSION

Exercise during acute hospitalization increased (non-significantly) strength compared to the reduction (non-significant) observed in habitual care patients(1, 4). They do not confirm that moderate intensity functional weight-bearing exercise prevents functional decline during an acute hospitalization. Further studies with larger sample or selective chronic conditions are needed. Also maybe it is necessary a continuous supervision of exercise, a period of follow-up after discharge that examine functional performance, independence in ADL or adverse events (like readmission, functional dependence, cognitive impairment, or mortality).

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Poster

EFFECTS OF 6 MONTHS OF MULTICOMPONENT TRAINING VS. WBV ON STRENGTH IN POSTMENOPAUSAL WOMEN

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INTRODUCTION

Strength is an important component of health and quality of life respect to the prevention of falls and fractures risk in older people (1). Whole body vibration (WBV) and multicomponent training are effective method for improving fitness in this population. Therefore, the aim of this study were to analyze the effects of different training programs on isokinetic strength in postmenopausal women.

METHODS

A longitudinal, quasi-experimental, intra and inter-subjects design with pre and post-test, with a control group was conducted. Mid-test was performed at 3 months (only to the experimental groups). Took part in the study 39 sedentary postmenopausal women (aged 59.6 ± 6.3 years; height 156.3 ± 4.7 cm; weight 73.6 ± 11.6 Kg). The experimental groups performed an incremental vibration training (WBVG) and a multicomponent training (MTG) for 6 months, 3 sessions/week. The subjects in WBVG remained on the platform in a static semi-squat position with a hip/knee angle of 120º and performed ankle plantar flexion every 6 times (100bpm). Participants in MTG combined aerobic exercise with jumps. Isokinetic muscle strength of the knee ($60º \cdot s^{-1}$ and $270º \cdot s^{-1}$) was assessed.

RESULTS

Isokinetic strength increased significantly from pre-test to post-test in WBVG (p=0.015) and MTG (p=0.001) in knee extension at $60º \cdot s^{-1}$. For isokinetic strength in knee extension at $270º \cdot s^{-1}$ both WBVG (p=0.018) and MTG (p=0.001) groups significantly increased between pre-test and post-test, and in MTG (p=0.006) from pre-test to mid-test. Significant differences were observed for power in knee extension at $60º \cdot s^{-1}$ in MTG from pre-test to post-test (p=0.001) and between mid-test and post-test (p=0.023). The power in extension at $270º \cdot s^{-1}$ increased in WBVG (p=0.002) and MTG (p=0.001) between pre-test and post-test, and in MTG from mid-test to post-test (p=0.026). Significant changes were not observed in control group (CG).

DISCUSSION

In relation to the improvement of the strength and power in WBVG, some researchers state that these strength gains are the result of a reflex called "tonic vibration reflex" which consists of an active contraction of the vibrated muscle (2). Increases the strength of the knee and hip extensors are associated with better mobility (3) and a lower risk of falling. The adaptations found in the present study may be of use in counteracting the loss of muscle strength associated with age.

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Poster

EFFECTS OF 6 MONTHS OF MULTICOMPONENT TRAINING VS. WBV ON BODY COMPOSITION IN POSTMENOPAUSAL WOMEN

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INTRODUCTION

The aging process is associated with changes in body composition that may lead to the emergence of various diseases like obesity, sarcopenia and osteoporosis (1). Whole body vibration (WBV) and multicomponent training are effective methods for improving fitness in this population. Nevertheless, precise protocols should be defined to get adaptations in body composition.

Therefore, the aim of this study were to analyze the effects of different training programs on body composition in postmenopausal women.

METHODS

A longitudinal, quasi-experimental, intra and inter-subjects design with pre, and post-test, with a control group was conducted.

Mid-test was performed at 3 months (only to the experimental groups). Took part in the study 39 sedentary postmenopausal women (aged 59.6 ± 6.3 years; height 156.3 ± 4.7 cm; weight 73.6 ± 11.6 Kg). The experimental groups performed an incremental vibration training (WBVG) and a multicomponent training (MTG) for 6 months, 3 sessions/week. The subjects in WBVG remained on the platform in a static semi-squat position with a hip/knee angle of 120º and performed ankle plantar flexion every 6 times (100bpm).

Participants in MTG combined aerobic exercise with jumps. Body composition was assessed by densitometry (DEXA).

RESULTS

Total fat percentage significantly decreased (p=0.017) during the first 3 months and fat mass in left leg (p=0.018) decreased in WBVG. Fat mass in the right leg (p=0.018) increased and trunk lean mass (p=0.021) decreased in control group (CG). We found an increase in lean mass in the left leg in MTG (p=0.018). Significant changes were not observed in bone mineral density (BMD) and bone mineral content (BMC) in any group in the 3 measuring times.

DISCUSSION

The training programs produced significant adaptations in body composition, decreasing fat levels in WBVG and improving lean mass in MTG. Therefore, these training methods may be of use in prevention of obesity and sarcopenia risk in older people The initial bone levels were lower to those after exercise. It can be considered one of the main measures to be promoted in older adults as a preventive approach to bone health (2, 3).

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RELATIONSHIPS BETWEEN VERTICAL JUMP PERFORMANCE, LINEAL SPRINT AND SPRINT WITH CHANGES OF DIRECTION

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INTRODUCTION

Jumping tests have been used as predictors of change of direction (COD) performance (1), and the strech-shortening cycle (assessed, among others with vertical jump tests) is employed to estimate the ability to perform linear and COD sprints with high effectiveness (2). However, difference between studies has shown disparity in the magnitudes of the correlations, therefore the purpose of this study was to investigate the relationship between lineal sprint, sprint with COD and jumping performance.

METHODS

Thirty-four young healthy active males (22.58±3.0 years; 77.5±11.0 kg) were assessed over 10 and 20-m lineal sprint (T10-m and T20-m, respectively), and a 10-m COD sprint tests (T10-mCOD) with 90º and 180º right and left turns. Jumping performance was evaluated using Countermovement Jump (CMJ) and Abalakov Jump (AbkJ). Three trials were performed and the best jump of each subject was used for the statistical analysis. The average speed loss due to execute COD (%Dec-COD) was calculated through the next formula: [(T10-m – T10-mCOD)/ T10-m) x 100].

RESULTS

AbkJ and CMJ were very large and large correlated with T20-m (r = -0.71 and r = -0.61, respectively). T10-mCOD 180º with right and left turns was large related with T20-m (r = 0.59 and r = 0.59, respectively), while T10-mCOD 90º reflected small relationships with T20-m (r = 0.43 and r = 0.45, respectively). There was no relationship between jumping performance and T10-mCOD or between jumping performance and %Dec-COD.

DISCUSSION

The results of the present study revealed that the most powerful players (jumping performance) has the ability to sprint rapidly in a straight line (20-m), but not at a distance of 10-m in a straight line or during 10-m with COD. In addition, greater jump performance is not related with a substantially smaller %Dec-COD or with a lower time in 10-m with COD, therefore and in contrast with the results shown by Castillo-Rodriguez et al. (2013), jumping performance is not a predictor of COD ability.

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Poster

RELATIONSHIPS BETWEEN SPRINT, JUMPING PERFORMANCE AND LOWER LIMB POWER IN A FLYWHEEL RESISTANCE MACHINE

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INTRODUCTION

A substantial relation has been observed between maximal strength in half squat, vertical jump height and lineal sprint performance (2).

However, difference between studies have shown disparity in the magnitudes of the correlations due to the heterogeneity of the subjects (1). Therefore, the purpose of this study was to investigate the relation between lineal sprint, vertical jump performance and for first time, lower body power output using flywheel resistance device with eccentric overload.

METHODS

Thirty-four young healthy active males (22.58±3.0 years; 77.5±11.0 kg) were assessed over 20 and 30-m lineal sprint (T20-m and T30-m, respectively).

Vertical jump performance was evaluated using Countermovement Jump (CMJ) and Abalakov Jump (AbkJ). Three trials were performed and the best jump of each subject was used for the statistical analysis.

Lower limb power was assessed by the half-squat exercise in a flywheel resistance machine with eccentric overload (Exxentric®) equipped with two flywheels with a moment inertia of 0.05 $kg \cdot m^{-2}$ each. Subjects performed 2 sets of 7 reps with 3 min rest between series. Best concentric average power (BP) (W) & relative power (BRP) (W/kg), and the best 4 rep concentric average power (B4P) (W) & relative power (B4RP) (W/kg) were selected for the statistical analysis.

RESULTS

AbkJ and CMJ showed very large and large relationships with T20-m (r = -0.71 and r = -0.61, respectively), and T30-m (r = -0.73 and r = -0.63, respectively). BRP and B4RP values were largely correlated with T20-m (r = -0.58 and r = -0.50, respectively) and T30-m (r = -0.58 and r = -0.49, respectively), while absolute power variables didn't show relations with T20 & T30-m. None of the variables were related with T10-m. As expected, AbkJ and CMJ also showed large relationships with BRP (r = 0.61 and r = 0.63, respectively) and with B4RP (r = 0.56 and r = 0.58, respectively).

DISCUSSION

Although correlations do not imply cause and effect, BRP and B4RP during half-squat exercise in a flywheel resistance machine with eccentric overload (Exxentric®) may predict the jump and sprint performance. The findings of the present research as well as previous studies (1,2), suggest that athletes should focus on strength training with emphasis on maximal mobilization of concentric phase in a half-squat exercise in a flywheel resistance machine, which may improve their sprinting and jumping performance.

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Poster

THE INFLUENCE OF THE WARM-UP IN POWER EXERCISE LEG-PRESS IN AMATEUR ATLETHES

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INTRODUCTION

Warm-up aims at the preparation before the effort required by physical activity, is a globally accepted by the various authors who have focused on the field along numerous studies (1). Has even been observed, usually used three types of heating: specific warm-up, flexibility exercises and aerobics (2, 3). Therefore arises the doubt between the use of a type of heating or other to maximum resistance. The objective of the study was to analyze the influence of two types of warm-up (dynamic and standard) in power exercise leg-press.

METHODS

27 (15 male, 12 female) amateur atlethes (24±3,7 years, BMI 22,3±1,1) they were divided into 3 groups for six weeks. 2 days a week training thewarm-up (WUp). The test were 3 and 6 weeks. The control of execution of the test speed was measured with metronome.Group 1 (DEG=9) make week 1, 2 and 3 dynamic WUp and week 4, 5 and 6 standard WUp. Group 2 (EG=9) make every time standard WUp. And Group 3 (DG=9) make every time dynamic WUp. All the WUp were supervised. The test consisted of performing the highest number of repetitions (20 maximum) with a submaximal load to failure (4).

RESULTS

We have not have produced significant differences between groups. If there have been differences between the results of the test (1 and 2) percentage of improvement in all groups (DEG1 57,1 vs DEG2 58,7; EG1 58,6 vs 69,6 EG2; DG1 55,9 vs DG2 61,1).

DISCUSSION

Our results are consistent with other studies (2, 5, 6) where there is no influence of different WUp in power exercise. We should study the influence of WUp and compare it for longer periods of time. There are no significant differences in the performance of the test in the exercise leg-press, with different types of warm-up applied.

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Poster

EFFECTS OF 6 WEEKS OF HIGH-RESISTANCE CIRCUIT TRAINING VS TRADITIONAL STRENGTH TRAINING ON MAXIMAL STRENGTH AND POWER LEVELS IN UNIVERSITY PADDLERS

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INTRODUCTION

Canoeing is a sport that requires high levels of maximum strength and power output (1). High maximum strength training has been traditionally carried out lifting heavy loads in a medium-short recovery period between series (2). High-resistance circuit training (HRC) may be an alternative to achieve improvements on maximum strength and performance levels (3) in a reduced time (4). Therefore, the aim of this study was to compare a traditional strength training method vs. a HRC protocol in the variables mentioned above.

METHODS

Seventeen undergraduate volunteers canoeists (20,9±1,2 years old) took part in the research. The sample was divided in two groups: traditional strength (TS)protocol (G1=9), and HRC protocol (G2=8). The training lasted 6 weeks with an undulating periodization, the training frequencywas2 days per week with pre and post-test. Maximum strength and power output were assessed during the bench press exercise with a 1RM test, power output was assessedat different loads (30, 45, 60, 70 and 80% of 1RM). Signification was set at $p \leq 0.05$.

RESULTS

No significant differenceswere found among training groups, but there were a time effect between pre and post-test ($p \leq 0.05$) for both training groups in maximum strength (G1= 11.5 ± 8.34W; G2= 8.10 ± 5.9W), and power output at all loads (G1=66.5±77.5W; G2=78.7±82.2W).

DISCUSSION

Both protocols produced an increase in maximum strength as shown with previous studies with a HRC (3) methodology. There was, also, similar increase in muscles power in bench press with loads between 30-80% of 1RM, as happened in the studied developed by Alcaraz et al. (3) with trained participants. This may be due to 2 facts, as Alcaraz et al. (3) considers, 1) the increases in maximum strength, and 2) to the fact that the lifted loads during the concentric phase were performed at maximum speed in the training. Therefore, HRC may be a good tool to generate improvements in strength and power levels in young paddlers with a reduced training time.

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SURF POWER PADDLING: VELOCITY AND ACCELERATION ANALYSIS

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INTRODUCTION

Surf literature reports, during recreational (1) and professional (2) surf sessions, a movement proportion of, ~50% paddling and ~40% in stationary position. The power paddling in surf has great importance to enter in the wave with appropriated velocity, to establish a balanced position in the wave lip and in the preparation to execute pop-up maneuver to stand up in the surfboard (3). Our objective was to analyze both velocity and acceleration during surf power paddling.

METHODS

Five male recreational surfers (34 ± 4 years of age, 81.0 ± 10.0kg of weight and 1.74 ± 0.5m of height) that are engaged in surfing practice at least once a week were evaluated in a 25m swimming pool using an electromechanical velocimeter to determine an individual velocity/time curve (50 Hz). The velocimeter line was connected to the central point on lumbar region of the surfer. After the warm-up, the subjects performed three trials of 10s of power paddling at maximum intensity, without kicking, using their own surfboard (with 5min rest interval).

RESULTS

The Intraclass correlation coefficient for three trials were 0.97 (CI 95%: 0.96 to 0.97) for velocity and acceleration. Regarding the global performance of the surfers (10s), it was possible to fragment the entire curve in three distinct phases: Incremental (IP) the first 4s, Maintenance (MP) 2s and Fatigue (FP) the last 4s. The values of velocity and acceleration in the different phases were: IP (1.363 $m.s^{-1}$ ± 0.404), MP (1.76 $m.s^{-1}$ ± 0.037) and FP (1.749 $m.s^{-1}$ ± 0.072). IP (0.316 $m.s^{-2}$ ± 0.247), MP (0.011 $m.s^{-2}$ ± 0.021) and FP (-0.027 $m.s^{-2}$ ± 0.062). Differences were found for the velocity ($F(2, 498)=133.63$, $p<0.001$, effect size 34%) and acceleration ($F(2,498)=254.79$, $p<0.001$, effect size 50%), between phases.

DISCUSSION

The velocity values of our study were similar to the ones found for competitive surfers (3), however without taking into account the different phases of the performance curve. It was possible to observe that the on IP phase it was necessary 4s, so that the velocity went to a plateau, and the acceleration maintained positive. In this phase it is important observe the rate of acceleration/time. In the MP, the velocity remained constant and consequently the acceleration was zero, and it had a mean duration of 2s. It is important to observe the fluctuations of the acceleration. The last phase, FP, showed a great variability. Probably this phenomenon can be related to the anaerobic energy system. The results gave new insights on the surf power paddling that should be taken into account in future interventions in surf training, to reach the top velocity faster in IP and attain longer duration in MP.

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Poster

EFFECTS OF PLYOMETRIC TRAINING ON VERTICAL JUMP PERFORMANCE IN VOLLEYBALL PLAYERS

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INTRODUCTION

Vertical jump (VJ) performance is considered as one of the most important element for successful athletic performance (1).

In volleyball the VJ is performed frequently during practices and games. In fact, volleyball players require to jump vertically as high as possible in defensive (blocking) and offensive (attacking, passing and serving) maneuvers. Several studies have shown that plyometric training (PT) improved the VJ height (2).

However, others studies did not observe improve (3) or even reported negative effects (4). The aim of this study was to determine the effect of 5-week of PT on VJ height in volleyball girls and boys.

METHODS

A total of 34 subjects participated in the study, 20 girls, and 14 boys between 13 and 16 years old. All of them had an experience of at least 4 years praying and training volleyball. Subjects were tested at the beginning and after the training period. We used a force platform to measure the countermovement jump (CMJ) height. A 5-week PT programmed was developing twice a week after the warm-up lasting around 20 minutes.

RESULTS

A significant relationship was observed between the training programme and the increase of VJ height (p=0.005) in the subjects tested after 5 weeks. In all the remaining variables analyzed, no significant relationship were found (p>0'005).

DISCUSSION

The results demonstrated that PT is an effective method to improve VJ in young volleyball players of both sex. Therefore, this kind of training could be recommended to those sports in which vertical jump performance were essential to have success, like volleyball or basketball.

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HOME-BASED EXERCISE IMPROVES FITNESS IN ADULTS WITH POLIO RESIDUALS: A RANDOMISED CONTROLLED TRAIL

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INTRODUCTION

Polio survivors can suffer physical and health deficits like fatigue, weakness, pain, low level of fitness, low perception of health, high blood pressure, depression, sleep impairment (1, 2). Some effects of these deficits can lead to reduced mobility and adversely affect daily living activities (3). Regular physical activity has been shown to be beneficial to patients with post-polio syndrome (4). In order ensure good adherence to an exercise program and reduce burden for participants home based program could be effective among individuals with post-polio syndrome.

METHODS

Forty one polio survivors participated in this study, 23 were allocated in the intervention group (48.0 ± 7.8 years; 70.0 ± 15.0 kg; mean ± SEM), and eighteen were allocated to the control group (48.7 ± 7.7 years; 65.9 ± 11.6 kg). The experimental group trained 3 times per week over 12 weeks, twenty-two participants completed the program attending an average of 29 sessions. Musculoskeletal-related fitness tests were performed before and after de 12 weeks of intervention in a standardised order for all of the patients, with 5 minutes of rest between each test to ensure complete recovery. The order of tests was as follows: flexibility of the legs and trunk, functional reach test, hand grip strength, trunk muscle endurance, 6 minute walking test (6MWT), the time up and go test (TUG) and performance oriented mobility assessment (POMA). The significance level was set at $p < 0.05$ for all tests.

RESULTS

The intervention group shown a significant improvement compare to the control group in the 6MWT (6.3%), abdominal endurance (81%), right hand-grip (27.8), and flexibility (30%), all $p<0.05$; whereas the others fitness tests: TUG, functional reach, left hand-grip, and POMA were unaffected.

DISCUSSION

This study demonstrated that 3 months of strength training and flexibility is enough in patients with polio to enhance muscle endurance and consequently gait performance. The present exercise protocol was feasible and improved fitness in adults with polio residuals and no adverse side-effects were detected.

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Poster

EFFECTS OF 6 WEEKS WHOLE-BODY VIBRATION TRAINING IN MAXIMAL ISOMETRIC STRENGTH OF TRICEPS SURAE MUSCLE

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INTRODUCTION

The applied use of new technologies to enhance performance and improve health has been increasing. Whole body vibration training (WBVT) on a platform is considered a suitable training system to increase strength and muscle power (1). The aim of this study was to analyze the effects of a 6-week vibration-training program on maximal isometric strength in plantar flexion at 0°,15°,30°,45°.

METHODS

Twenty-nine physically active (measured with ActiGraph accelerometer) and healthy participants aged 18-25 participated voluntarily in this study. Participants were randomly allocated into the control group (CG; n = 10, height: 168.2 ± 7.1 cm, weight: 65.1 ± 9.6 kg, age: 23.7 ± 3.4 years) and the experimental group (EG; n = 19, height: 162.5 ± 4.3 cm, weight: 58.5 ± 6.0 kg, age: 23.9 ± 4.9 years) that performed 6 weeks incremental vibration training with a frequency of 3 sessions per week (7.2–32.6 g). Each exercise was repeated 3 times per session, with a rest of the 30 s between repetitions and 60 s between exercises without vibratory stimulus outside the platform. Peak torque of right leg was analyzed during a maximal isometric contraction with an isokinetic dynamometer (Biodexsystem 3, Biodex, Corp., Shirley, NY) before and after the training program. The Peak Torque was measured in four positions (3rep/5s for position) of plantar flexion (0º, 15º, 30º and 45º).

RESULTS

Intra-group differences: Isometric strength (peak torque) increased statistically significant after training vibration in WBVG in plantar flexion at 0 º (mean difference: 11.84 N*m; p = 0.02), 15º (mean difference 9.42 N*m; p = 0.02), 30 º (mean difference 5.29 N*m; p = 0.02) and non-significant increase at 45º (mean difference 4.24 N*m; p = 0.14). Increased statistically non significant in the peak torque in the CG were observed at 0°, 15°, 30°, 45°. Inter-group differences: after the training statistically significant differences at 30° (GC: 30.99 N*m ± 9.14 vs. GE: 37.26 N*m ± 12.44; p = 0.04) and 45° (CG: 12.79 N*m ± 4.44 vs. EG: 21.21 N*m ± 14.20; p = 0.01) between the CG and EG were observed.

DISCUSSION

The effects of WBV training programs are determined by neural adaptation and possible hormonal and biochemical changes. In relation to the improvement of the strength and power in WBVG, some researchers state that these strength gains are the result of a reflex called “tonic vibration reflex” which consists of an active contraction of the vibrated muscle (2). Torvinen et al. (3) observed significant increases in isometric strength after vibration training program in physically active people and athletes. In conclusion, we observed that 6 weeks of vibration training at intensities ranged between 7.2-32.6 g improved maximal isometric strength of the triceps surae muscles of the right leg at 0º, 15º, 30º.

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AGE-RELATED DIFFERENCES IN SPORT-SPECIFIC FITNESS DETERMINANTS IN ELITE FEMALE SOCCER PLAYERS

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INTRODUCTION

Variations in sport-specific fitness determinants of different age categories in elite female soccer players may cause mistakes in physical conditioning. This fact especially gets its importance if the claims that the fitness qualities such as speed and explosive power for female sex finish their biological development very early are taken into account (1). For further development they need an adequate physical conditioning. The main aim of this study was to investigate the differences in physical match performance, sprint abilities, explosive leg power, acceleration, agility, anaerobic power and specific movement between U15, U17 and A-Team of female national soccer teams.

METHODS

High-level female soccer players (n=65) were evaluated on countermovement jump, standing long jump, 10 m sprint, 20 m „flaying" sprint, 30 m sprint, Ajax test 5x10 m, zigzag, zigzag with ball, 300 yards shuttle, Yo-Yo intermittent recovery test, level 1. Separate one-way ANOVAs and post hoc analysis (Tukey post hoc test) were used to compare physical performance characteristics between three age groups: U15, n=21, U17, n=20 and A Team, n=24.

RESULTS

Outcomes from the group data indicated better performance on all tests for the A-Team. However, the differences found between female players of three national teams in the tests countermovement jump up (p=.248) and standing long jump (p=.254) are not statistically significant.

DISCUSSION

A scientific documentation of a decline in adolescents physical fitness level is limited (2). The identical situation is for female adolescents in sport. Muscular strength and power are important components of fitness essential for the execution of a variety of daily and sporting activities. Analyses of the genetic determinants of strength provide information concerning the contribution of both genes and environmental factors (3). On the other side, all fitness qualities that were the object of research in this study continued to develop after the age of 15, while an explosive leg power stayed unchanged. Regardless of a very early maturation of these abilities in female sex, namely more than 90% up to the age of 15 (1), the results of this study indicate that in a sport game such as female football, the training systems for the improvement of this ability as one of the most important in contemporary female soccer must be more quality programmed.

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Poster

ACUTE EFFECTS OF HIGH-INTENSITY INTERVAL TRAINING AT OPTIMAL (POWER) LOAD VS. TRADITIONAL OPTIMAL LOAD TRAINING

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INTRODUCCTION

High-Intensity Interval Training (HIIT) is considered one of the most effective methods for the improvement of cardiovascular and metabolic aspects (central and peripheral), and consequently the sport performance (Buchheit et al., 2013). Cormie et al., (2011), suggest that muscular power is a key factor on the improvement of sport performance defending that there is an Optimal Load that highlights for its advantages and neuromuscular specific adaptations to improve the mechanical power and the specific performance on speed-strength sports (Cormie et al., 2011; Kawamori et al., 2004). Many studies have tried to combine the strength and resistance training (Docherty et al., 2000), but none have used the combination of HIIT and power with the Optimal Load. The aim of this study will be to determine the acute effects of traditional power training (TS) VS HIIT training working with the optimal power (Power HIIT).

METHOD

10 subjects (age = 23.1 ± 3.7, weight = 82 ± 9.2) trained force realiced two training methods, PowerHIIT and TS. The workout consists of 4 exercises chosen to maximize muscle power as Cormie, McGuigan and Newton (2011). Were Bench Press Throw (1RM = 99.31 ± 13.57), Jump Squat, High Pull (1RM = 74.18 ± 11.36) and cycle-ergometer. PowerHIIT were realiced 10 seconds at top speed with 15 seconds rest between each exercise. Maximum possible repetitions were performed for 4 sets of each exercise. Each round was completed in 1.5 min. In the TS exercises per station has 1.5 min resting between sets.

RESULTS

We found significant differences between groups in the FC (PowerHIIT: 170 ± 6 ppm; TS: 124 ± 10 ppm), total duration (PowerHIIT: 6.5 min; TS: 26.5 min). Also in the four series of Wingate. Bench Press Throw has differences in repeats 3, 4 and 5 of the set 2, repeats 2, 3, 4, 5 and 6 of set 3, repeats 1, 2, 3, 4, 5 and 6 of set 4. High-Pull in repeat 1 of the 2, 3 and 4 sets. There were no significant differences in lactate (PowerHIIT: 14.7 ± 2.3; TS: 15.0 ± 1.7).

DISCUSSION

The main results of our study are that the heart rate is significantly higher in PowerHIIT and power output is stable in exercises such as the High-Pull. However, the power in the Bench Press Throw and the Wingate was reduced significantly with the advancement of training PowerHIIT compared to TS. Alcaraz et al. (2008) found similar heart rates when comparing high intensity circuit training HRC vs TS, however power reduction in Bench Press was not significant. We can conclude, even though in PowerHIIT power is reduced in some exercises, the heart rate is high (HRC: 135 ppm vs. PowerHIIT: 170 ppm) and the working time is reduced (HRC: 20 min vs. PowerHIIT: 6.5 min) by what may be a strategy very useful to produce adaptations in power and endurance with a very little time work.

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CARDIO WORKOUT: ESTIMATED VO2 MAX AND MEAN ANAEROBIC POWER

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INTRODUCTION

Maximal oxygen consumption(VO_2max) is an accepted index of cardio-respiratory fitness and functional aerobic capacity (1).Anaerobic power or capacity is an expression used for the maximal exercise up to a maximum of two minutes. The aerobic workout zone is between 50 percent and 80 percent of maximum heart rate. Moreover, the highest anaerobic workout zone is 80 percent of maximum heart rate. The aim of this study was to investigate if a cardio workout program improved estimated VO_2 max and mean anaerobic power in female.

METHODS

Twenty university student women who have well trained for one year, voluntary and healthy were participated to this study. The women divided in two groups such as exercise and control groups. Exercise group were participated cardio workout for 6 weeks, 3 sessions in week and 45 minute in sessions. The Rockport 1 mil walk test for estimated VO_2 max and anaerobic stepping test for mean anaerobic power were applied before and after 6 week exercise program. To calculate estimated VO_2 max were used formula (2). To calculate mean anaerobic power was used equation (3). Cardio workout program; running, V step, jumping jack, knee up for warm up, squat, side and front lunge, squat dumbbell pres, dumbbell side lateral, bent over side lateral, dumbbell kick back, two dumbbell rowing,etc.Mann Whitney U and wilcoxon tests were used for data analysis. The study protocol is in accordance with the declaration of Helsinki.

RESULTS

The results showed that there were significant differences estimated VO_2 max and mean anaerobic power between before (58.31±2.21mL·kg^{-1}·min^{-1}; 217.12±29.98W) and post exercise(62.14±2.41mL·kg^{-1}·min^{-1}; 221.33±30.79W) in exercise group($p<0.05$).

There were significant differences in estimated VO_2 max between exercise group(62.14±2.41mL·kg^{-1}·min^{-1}) and the control group (41.94±5.02 mL·kg^{-1}·min^{-1}) ($p<0.05$) and there were significant differences in mean anaerobic power (221.33±30.79W) between exercise group and the control group ($p<0.05$).

DISCUSSION

As a result, six week cardio workout effects estimated VO_2 max and mean anaerobic power positively and improved women' VO_2 max by 3.83 ml · kg· $^{-1}$min^{-1} and mean anaerobic power by 4.21 W. Cantrel et al., suggest that performing concurrent sprint interval and strength training does not attenuate the strength response when compared to ST alone, while also improves aerobic performance measures, such as VO_2 max at the same time (4).

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Poster

BEACH HANDBALL TO IMPROVE JUMPING POWER

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INTRODUCTION

The off-season is the period between the last competition period and the first period of the next year's season. The length of time recommended for the off-season period should provide enough time to recover for next season. When reduced volume or intensity training occurs it is called detraining, defined as cessation of exercise training, and is a deconditioning process that affects performance due to diminished physiological capacity. Handball players normally participate in off-season training that requires different activities for maintaining physical condition. Professional players utilize the off-season to improve their capacities (hypertrophy) but some players practice beach handball in summer time. Therefore, thefirstaimof this paper is to determine the effects of beach handball on explosive strength indicators in adult handball players. The second aim is to compare a group of handball players who perform beach handball off season to handball players who perform other sports not related to handball.

METHODS

The study included 23 non-professional players divided into two groups, one experimental group and one control group. The first group plays beach handball during the indoor handball off-season and the other group participates in sports such as running, fitness or padel. The 13 players from the experimental group completed the beach handball season with a great number of matches and the control group of 10 players didn't participate in the beach season. All subjects were measured based on explosive force (heigh) and power (Peak Power) of the lower limb by performing the Counter Movement Jump (CMJ) and Abalakov Jump (ABK) test using force platform Quattro Jump (Kistler, Switzerland).

RESULTS

The average changes in the explosive test performances in CMJ and ABK were measured in cm (Heigh) and Peak Power in CMJ and ABK; in the Beach Handball Group the CMJ_Heigh in men decreased by 6% but in women no changes were registered. ABK_Heigh in men decreased by 4% but in women increased by 9%, CMJ_Peak Power decreased by 2% in men and in women increased by 3%. ABK_Peak Power decreased by 1% in men but in women increased by 11%. The control group registered no significant effects in all variables.

DISCUSSION

We found that beach handball has significant effects on the improvement of explosive strength in women but has no significant effects in male handball players. The result of this study may be useful for handball players and their coaches in terms of managing the off-season period. Beach handball is a good activity to perform in off-season period to fight against the effects of cessation training when the season is finished.

ASSOCIATIONS BETWEEN BODY COMPOSITION AND NEUROMUSCULAR PERFORMANCE IN YOUNG SOCCER PLAYERS

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INTRODUCTION

Vertical jump performance has been identified as a relevant tool in order to assess soccer performance and talent detection (1, 5). Body composition has been included among vertical jump confounders' parameters (2). Therefore, the aim of this study was to analyze the relationship between body composition and vertical jump in young soccer players aged 7 to 23 years.

METHODS

Four hounded and thirty-four Spanish young soccer players (12.9± 3.5years; 1.6 ± 0.1 m; 48.2± 15.4 kg), who had trained for ~1.5 h·day^{-1}, 3 days·week^{-1}took part in this study. Participants were divided in category groups, as follow: A) under 9 yrs;B) under 11 yrs; C) under 13 yrs; D) under 15 yrs; E) under 17 yrs; F) under 23 yrs. Three vertical jump tests were performed to measure jump height: squat jump (SJ), counter-movement jump (CMJ) and counter-movement jump free arms (CMJa). Fat and fat free mass were measured by bioimpedancesystem.

RESULTS

Fat mass showed no significant differences among categories under 13 yrs (A, B, C); however, significant decrease was detected among categories under 13 yrs and those aged 15 to 23 yrs (D, E, F) ($P< 0.05$). On the other hand, fat free mass reported a significant increase among all a categories ($P< 0.05$), even though the higher increase was found between category C and D. Equally, vertical jump tests showed significant differences among all categories ($P< 0.05$) and the higher augment was detected between category C and D.Finally, fat free mass reported a significant higher positive association with all jump height tests (r=0.748 in SJ, r=0.788 in CMJ andr = 0.786in CMJa).

DISCUSSION

In agreement with previous studies (3), our data showed that the greater changes in vertical jump performance occurred among 13 to 15 years period, even though significant differences were detected among all categories. In addition, the improve in vertical jump performance was accompanied by a decrease in fat mass and a increase in fat free mass which could be explained due to the hormonal variation during puberty (4). Thus, we concluded that body composition measurement through electrical bioimpedance was useful in order to evaluated fairly vertical jump performance in Spanish young soccer players.

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Poster

EFFECTS OF WHOLE BODY MECHANICAL VIBRATION ON THE STRENGTH AND JUMP PERFORMANCE IN BEACH VOLLEYBALL

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INTRODUCTION

Recent research has shown the effect of whole body vibration (1). Similarly, we can see that some researchers have focused on increasing strength (2). For this, they have undergone various forms athletes weekly sessions work (3). The main objective of this study is to examine the effect of the method of training whole body vibration (WBV) in beach volleyball, the impact on increasing leg strength and therefore its effect on performance jump.

METHODS

Test Squat Jump (SQJ) Countermovement Squat Jump (CMJs) and maximum leg press test (1RM) was performed in the study. Twelve male beach volleyball players under elite, all belonging to an university training program, were separated in two groups, one of 6 players with mechanical training whole body vibration (WBV, 30-40 Hz, 1.7-2.5mm, 3.0-5.7 gr.) and other 6 players with a traditional training. Both groups were subjected to a protocol of 6 weeks training to check the variation in strength and jump performance.

RESULTS

The results showed a significant increase in SJ (6.00 ± 1.41 cm), CMJ (5.52 ± 1.58 cm) and increased (1RM) leg press jumps (27.50 ± 8.21 kg.) In the post-test performed on the vibration training group, unlike the traditional training group ($p<0.05$).

DISCUSSION

We show that the continuous action of WBV methodology used in our study and other events before (1) has a positive effect in increasing jump and leg strength. Therefore, in the present study, we can conclude that training with whole body vibration (WBV) in beach volleyball players increase leg strength and improved jump performance.

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EFFECTS OF WHOLE BODY MECHANICAL VIBRATION ON THE STRENGTH AND JUMP PERFORMANCE IN VOLLEYBALL

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INTRODUCTION

Different studies have shown improvements in the use of whole bodyvibration for improvement in jump height in athletes of different disciplines (1), which has demonstratedincreased 1RM (2). The aim of this study is to determine the effect of whole body vibration (WBV) in jump performance in volleyball players.

METHODS

It was performed a test before and after training. Squat Jump (SQJ) Countermovement Squat Jump (CMJ) and maximum leg press test (1RM) were carried out. Eleven volleyball playersunder elite belonging to an university training program, were divided into an experimental group (6 players) and a control group (5 players). The experimental group was subjected to a 6 weeks workwith whole body vibration at 30-40 Hz, 1.7-2.5mm and 3.0-5.7 gr. The control group performed a traditional training.

RESULTADOS

The results showed an increase in jump height analyzed SQJ (1.52 ± 0.69 cm), CMJ (1.17 ± 0.71 cm) and increased (1RM) leg press in (7.50 ± 2.73 kg.) In the post-test performed in the group of vibration training, without establishing a statistically significant difference with the results from the group that carried out a traditional training (control group) ($p > 0.05$).

DISCUSION

This study shows that the continuous action of WBV produces evidence that vibration has a positive effect on jumping action and increased leg strength. With the work of whole body vibration strengthen and reinforce the muscle-skeletal structures during the stretch shortening cycle muscle stabilize it, still working with the whole body vibration training suitable for greater muscle recruitment and a greater myoelectric activity (3). Therefore the present study, we can conclude that training with whole body vibration (WBV) is a strengthening of muscle-skeletal structures as well as increased recruitment and myoelectric activity than traditional training loads.

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Poster

EFFECTS OF SPECIFIC PHYSICAL PREPARATION AND LOWER BODY POWER RELATED SHOT

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INTRODUCTION

Different studies have shown that the ball hitting power between different players lies in the technique used and in the better use of that technique (1). There is equally an increase in the speed of exit of the ball at impact at various age levels (2) and the manipulation of the mobile´s distance with regard to the goalis positive (3). It replaces the maximum loads for plyometric exercises, whereit was possible to observe a significant improvement in countermovement jump (CMJ) and squad jump (SQJ) (4). This study's main objective is to analyse whether there is animprovement in the speed of the soccer ball on ball position and stop leg power through the test of SQJ and CMJ.

METHODS

The study sample is 45 participants (N = 45) football, with 11-12 years of age, where the test (SJ) was performed (CMJ) and test speed of the ball. They were divided into three groups: experimental A, B and C groups control. The experimental group was performed treatment of specific physical preparation, while the control group (B and C) are not applied treatment of specific physical preparation. An specific treatment of physical preparation was given to the experimental group, while this specific treatment was not applied to the control group (B and C). The three groups were subjected to a protocol of 12 weeks of training to check the variation of the lower body strength and performance of the shot.

RESULTS

The results indicate that there is a significant difference ($p<0.02$) in the test ball velocity between the control group 1 (76.56±2.8 km/h) and experimental group 2 (70.73±2.3 km/h) and group 3 (70.60±6.2 km/h) and ($p<0.01$) in the CMJ test between group 1 (30.92±3.8cm), group 2 (27.04±4.4 cm) and 3 (26.97± 3.7cm).

DISCUSSION

It is shown that the specific physical preparation methodology used in our study has a positive effect on increasing leg strength for jumping and ball velocity. Therefore, in the present study, we can conclude that training with an specific physical training in soccer players 8 is an improvement in jump performance and speed of the ball.

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ANALYSIS OF STRENGTH AND FATIGUE IN REPEATED SPRINTS IN PROFESSIONAL SOCCER PLAYERS

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INTRODUCTION

High intensity performance of soccer player is considered as key factor in elite soccer (Di Salvo & col., 2009; Chaouachi& col., 2010). In recent years, has increased the interest in studying the player's ability to perform repeated sprints (RSA). (Bishop & Edge, 2005). The information provided by field tests of RSA should ensure physiological responses similar to those occurring during intense periods of play in actual matches. Mechanical variables could provide a better understanding of mechanisms underlying differences in fatigue and performance, leading to coaches in establishing performance oriented test batteries to enhance fitness assessment and training prescription. Considering the aforementioned above highlighting main aspects of repeated sprint ability, the main purpose of this study was to investigate the changes through repeated sprint ability sequences in sprint and jumping ability, and metabolic response (lactate and ammonia) in professional Spanish soccer players.

METHODS

Eighteen professional soccer players (age 26.8 ± 3.66 yr., body mass78.15 ± 4.73 kg, height 180.21 ± 5.93 cm, body fat 9.36±3.14), who play in the Spanish first division performed 12 x 30 meters (measured with photocells MicrogateRacetime2 Light Radio), with 30 seconds recovery. Also three CMJ jumps were performed before and after repeated sprints (measured with IR platform Optojump Microgate, Bolzano, Italia). Together with this, Lactate and Ammonium (using portable analysers SensLab GmbH, Leipzig, Germany and Pocket ChemMenarini, Italy, respectively), were measured during the first minute after test. Thus, mechanical responses (i.e. height performance in CMJ and speed loss) and metabolic responses (i.e. blood lactate, and ammonia concentrations) were measured pre-exercise and post-exercise.

RESULTS

A related samples t-test was used to analyse CMJ height pre-post changes as well as to compare pre- and post-exercise lactate and ammonia levels. CMJ height loss pre-post session (8%) was significant, and fatigue, measured as CMJ height loss, was strongly correlated to lactate ($r = 0.97$; $p<0.001$) and ammonia ($r = 0.92$; $p<0.001$) for all players. The relationships between the variables studied were determined by calculating the Pearson correlation coefficients.

CONCLUSION

The metabolic stress developed during the effort can be estimated by controlling CMJ because of the high correlation between CMJ and blood lactate and ammonia concentrations. The high correlations found between mechanical (speed and CMJ height losses) and metabolic (lactate and ammonia) measures of fatigue highlight the utility and validity of using CMJ to monitor training load and quantify objectively neuromuscular fatigue during RSA.

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El conjunto de conocimientos que representan hoy las Ciencias de la Actividad Física y del Deporte, en sus distintos niveles y dimensiones, desempeñan una evidente función social que legitima su rango universitario. Evolucionadas en el tiempo, las Ciencias de la Actividad Física y del Deporte han ido adquiriendo una forma que no es neutral, puesto que ciertos discursos y prácticas son más legítimos que otros y es, dentro del contexto del devenir histórico, cuando se han construido las claves y fijado el espacio de acción sobre el que se ha actuado. Han sido los propios graduados partícipes los agentes o instrumentos en la consolidación y definición de esos límites en donde el origen de nuestras creencias respecto a las bondades del ejercicio físico ha adquirido un nuevo significado.

Antonio Sánchez Pato

Decano de la Facultad de Ciencias de la Actividad Física y del Deporte

Perfomance

ARTISTIC PERFORMANCE: ENSEMBLE

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3 Head of Master University of Dance and Art of Movement-UCAM. Murcia, Spain.
4 Director of University Dance Company-UCAM. Murcia, Spain.

INTRODUCTION

This project is a neoclassical dance piece around five minutes. It will be made by mean of inspiration of *Stabat Mater* of Pergolesi. It was the Musical Master piece of this Composer. The spirit of this performance is based in the connection between Catholic Tradition of New Testament and the Classical Ballet. The relationship between Mother and Son. Themes such as Suffering, pain, eternal and spiritual and eternal love are treated in this project. The frame and the context are very close to the concept of working because this artistic performance is made for Religious Building. For this reason the Holy Temple is a place of inspiration with the dancers.

Neoclassical ballet is the style of 20th century classical ballet exemplified by the works of George Balanchine (1). The term "Neoclassical Ballet" appears in 1920s with Sergei Diaghilev's Ballets Russes, in response to the excesses of romanticism and modernity. It draws on the advanced technique of 19th century Russian Imperial dance, but strips it of its detailed narrative and heavy theatrical setting. What is left is the dance itself, sophisticated but sleekly modern, retaining the *pointe* shoe aesthetic, but eschewing the well upholstered drama and mime of the full length story ballet (2).

REFERENCES

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ARTISTIC PERFORMANCE: MARE NOSTRUM

Molina García, M.D.[1,2,3], Castro Colomer, C.[3,5], Gómez-Lozano, S.[2,3,4]. (Artistic Directors)

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5 Head of Official School of Dance (Elemental level of Conservatory).

INTRODUCTION

This project is a set of 5 pieces. The whole duration of the performance is approximately 1 hour 30 minutes. It will be fragmented by break-intervals of ten minutes. The philosophy of this performance is showing the cultural aspects from Spanish tradition concerned to the tradition Dance. An historical travel around the different forms belongs to the women body language.

All this performance belongs to the Spanish Folk and Flamenco style. This composition tries to combine tradition and modernity. The choreographic pieces trace a musical and rhythmical path, which drives to the audience to keep contact with the dancers. Stylized Flamenco, Contemporary Forms included in the tradition, Folk Style called *Sevillanas* and the purest Flamenco tradition, will be felt and seen by the public. *Sevillanas* will be accompanied by a typical instrument in the Spanish dance named castanets. Completing the performance interpreters will spare some intense emotion of flamenco with the popular and traditional *Palos* (1). The purpose is to make the public be swayed by this outpouring of art and enjoyment while preserving and spreading the art of flamenco. This fact takes part of the anthropology of the dance (2).

REFERENCES

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2. Williams D. Anthropology and the Dance. University of Illinois Press, Urbana and Chicago, 1991.

ARTISTIC PERFORMANCE: STRENGTH

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INTRODUCTION

This project is based in the putting in scene of acrobatics and gymnastic elements which come from sports and artistic gymnastic (1).

It wants to establish a narrative line where actions transfer the value of sport and athletic performance. This artistic piece makes us to understand this indivisible union between art and sport where the performance in whole his sense is the common denominator. Actually, the Contemporary Circus is an spectacular form of performing art presence (1).

This piece will be developed by a quartet of athletics performers. Strength is a fundamental quality in the Sport or in the Dance. Maybe Circus is a middle way between both forms.

This piecetry to transfer to the audience the concept of *Superhuman*. In this way, in metaphorical way this artistic performance describes displays of extreme abilities. Qualities developed by humans, beyond what is believed to be normal. They are speculative term that is not commonly used in medical academia, as the concept has only a small body of anecdotal evidence to support it. Some sources use the term "superhuman strength" when describing observed symptoms, such as The American College of Emergency Physicians definition of excited delirium (2).

REFERENCES

1. Gwènola D. Cirque à la L'Oeuvre. Centre Nationel de Arts du Cirque. Les Editions Textuel, 2011.
2. The American College of Emergency Physicians. (http://www.acep.org/).

Normas de presentación de artículos en *CCD*

La Revista *Cultura_Ciencia_Deporte (CCD)* considerará para su publicación trabajos de investigación relacionados con las diferentes áreas temáticas y campos de trabajo en Educación Física y Deportes que estén científicamente fundamentados. Dado el carácter especializado de la revista, no tienen en ella cabida los artículos de simple divulgación, ni los que se limitan a exponer opiniones en vez de conclusiones derivadas de una investigación contrastada. Los trabajos se enviarán telemáticamente a través de nuestra página web: **http://ccd.ucam.edu**, en la que el autor se deberá registrar como autor y proceder tal como indica la herramienta.

CONDICIONES

Todos los trabajos recibidos serán examinados por el Editor y por el Comité de Redacción de *Cultura_Ciencia_Deporte (CCD)*, que decidirán si reúne las características indicadas en el párrafo anterior, para pasar al proceso de revisión por pares a doble ciego por parte del Comité Asesor. Los artículos rechazados en esta primera valoración serán devueltos al autor indicándole los motivos por los cuales su trabajo no ha sido admitido. Así mismo, los autores de todos aquellos trabajos que, habiendo superado este primer filtro, no presenten los requisitos formales planteados en esta normativa, serán requeridos para subsanar las deficiencias detectadas en el plazo máximo de una semana (se permite la ampliación a dos siempre y cuando se justifique al Editor). La aceptación del artículo para su publicación en *Cultura_Ciencia_Deporte (CCD)* exigirá el juicio positivo de los dos revisores y, en su caso, de un tercero. La publicación de artículos no da derecho a remuneración alguna; los derechos de edición son de la revista y es necesario su permiso para cualquier reproducción. En un plazo de cuatro meses se comunicará al autor la decisión de la revisión.

ENVÍO DE ARTÍCULOS

El artículo se enviará a través de la url: **http://ccd.ucam.edu/index.php/revista/login**. En el siguiente enlace, se encuentra el manual de ayuda para los autores en el proceso de envío de artículos (http://ccd.ucam.edu/documentos/manual_info_autores.pdf). Todo el texto debe escribirse en página tamaño DINA4, preferiblemente en "times" o "times new roman", letra a 12 cpi y con interlineado sencillo (incluyendo las referencias) y márgenes de 1 pulgada (2.54 cms) por los cuatro lados de cada hoja, utilizando la alineación del texto a izquierda y derecha (justificada). La extensión recomendada no deberá sobrepasar las 7500 palabras y 25 páginas incluyendo Figuras y Tablas. Las páginas deben numerarse consecutivamente con los números en la esquina inferior derecha. Sin separación entre párrafos.

- En la primera página[1] del manuscrito deben ir los siguientes elementos del trabajo: título del artículo en español y en inglés (en minúscula ambos), y un resumen del trabajo en español y en inglés, más las palabras claves en español e inglés. Por este orden, o al contrario si el artículo está en inglés. Al final de los títulos no se incluye punto.
- En la segunda página se iniciará el texto completo del artículo. El cuerpo de texto del trabajo deberá empezar en página independiente de la anterior de los resúmenes y con una indicación clara de los apartados o secciones de que consta, así como con una clara jerarquización de los posibles sub-apartados.
- El primer nivel irá en negrita, sin tabular y minúscula.
- El segundo irá en cursiva sin tabular y minúscula.
- El tercero irá en cursiva, con una tabulación y minúscula.

TIPOS DE ARTÍCULOS QUE SE PUEDEN SOMETER A EVALUACIÓN EN CCD

INVESTIGACIONES ORIGINALES[2]

Son artículos que dan cuenta de un estudio empírico original configurados en partes que reflejan los pasos seguidos en la investigación.

Título. Se recomiendan 10-12 palabras. Debe ser informativo del contenido y tener fuerza por sí mismo, pues es lo que aparecerá en los índices informativos y llamará la atención de los posibles lectores. Debe procurarse la concisión y evitar un excesivo verbalismo y longitud que no añada información. Se escribirá en minúscula tanto en español como en inglés.

Resumen

a) Debe reflejar el contenido y propósito del manuscrito.
b) Si es la réplica del trabajo de otro autor debe mencionarse.
c) La longitud no debe sobrepasar los 1200 caracteres (incluyendo puntuación y espacios en blanco), que equivalen a unas 150-250 palabras aproximadamente.
d) En estas 150-250 palabras debe aparecer: el problema, si es posible en una frase; los participantes, especificando las principales variables concernientes a los mismos (número, edad, género, etc.); la metodología empleada (diseño, aparatos, procedimiento de recogida de datos, nombres completos de los test, etc.); resultados (incluyendo niveles estadísticos de significación) y conclusión e implicaciones o aplicaciones.
e) Palabras clave: las 4 o 5 palabras que reflejen claramente cuál es el contenido específico del trabajo y no estén incluidas en el título (puede utilizar el Tesauro). Sólo la primera palabra se escribirá con capital. Se separarán con comas y al final se incluirá un punto.

Introducción. Problema del que se parte, estado de la cuestión y enunciado del objetivo e hipótesis de la investigación.

- Se debe introducir y fundamentar teóricamente el problema de estudio y describir la estrategia de investigación. En el último párrafo se debe establecer lo que va a llevar a cabo.
- Cuando se quiera llamar la atención sobre alguna palabra se usarán las cursivas, sin subrayar, ni negritas, ni mayúsculas. Se evitará también, en lo posible, el uso de abreviaturas, que no se usarán en los títulos de los artículos o revistas. Tampoco se admite el uso de las barras y/o, alumnos/as: habrá que buscar una redacción alternativa. En documento aparte, se presentan las directrices generales de estilo para los informes que utilicen el sistema internacional de unidades.

Método. Descripción de la metodología empleada en el proceso de la investigación. En esta sección deberían detallarse suficientemente todos aquellos aspectos que permitan al lector comprender cómo se ha desarrollado la investigación. La descripción puede ser abreviada cuando las técnicas suficientemente conocidas hayan sido empleadas en el estudio. Debe mostrarse información sobre los participantes describiendo sus características básicas y los controles utilizados para la distribución de los participantes en los posibles grupos. Deben describirse los métodos, aparatos, procedimientos y variables con suficiente detalle para permitir a otros investigadores reproducir los resultados. Si utilizan métodos establecidos por otros autores debe incluirse la referencia a los mismos. No hay que olvidar describir los procedimientos estadísticos utilizados. Si se citan números menores de diez se escribirán en forma de texto; si los números son iguales o mayores de 10 se expresarán numéricamente.

Este apartado suele subdividirse en sub-apartados:

- ***Participantes.*** Debe describirse la muestra (número de personas, sexo, edad, y otras características pertinentes en cada caso) y el procedimiento de selección. Además, en aquellos estudios realizados con humanos o animales es obligatorio identificar el comité ético que aprobó el estudio.
- ***Instrumentos.*** Especificar sus características técnicas y/o cualitativas.
- ***Procedimiento.*** Resumir cada paso acometido en la investigación: instrucciones a los participantes, formación de grupos, manipulaciones experimentales específicas. Si el trabajo consta de más de un experimento, describa el método y resultados de cada uno de ellos por separado. Numerarlos Estudio 1, Estudio 2, etc.

Resultados. Exposición de los resultados obtenidos. Los resultados del estudio deberían ser presentados de la forma más precisa posible. La discusión de los mismos será mínima en este apartado. Los resultados se podrán presentar en el texto, en Tablas o Figuras. Las *Figuras* son exposiciones de datos en forma no lineal mediante recursos icónicos de cualquier género. Las *Tablas* son un resumen organizado de palabras o cifras en líneas o renglones. Tanto las Figuras como en las Tablas no deben denominarse de ninguna otra manera. No se incluirán los mismos datos que en el texto,

1 Es importante que no se incluyan los nombres de los autores ni su filiación. Esta información ya se incluirá en el Paso 3 del envío en la web.

2 Las características y normas de presentación de las Investigaciones originales se han elaborado a partir de las utilizadas en la Revista Internacional de Ciencias del Deporte (RICYDE) (doi:10.5232/ricyde) (http://www.ricyde.org). Sin embargo, se observan diferencias evidentes en cuanto al formato.

en las tablas o en las figuras. Las Figuras y Tablas irán siendo introducidas donde corresponda en el texto, con su numeración correlativa (poniendo la leyenda de las Figuras en su parte inferior y la leyenda de las Tablas en su parte superior). Sólo se pondrán las estrictamente necesarias. Mantener las tablas simples sin líneas verticales (por ejemplo Tabla 1 y Tabla 2). El tamaño de la fuente en las tablas podrá variar en función de la cantidad de datos que incluya, pudiéndose reducir hasta 8 cpi máximo.

Cuando se expresen los datos estadísticos, las abreviaturas deben ir en cursiva, así como al utilizar el *p*-valor (que irá siempre en minúscula). Por ejemplo: *p, F, gl, SD, SEM, SRD, CCI, ICC*. Es necesario que antes y después del signo igual (=) se incluya un espacio. Se debe incluir un espacio también entre el número y la unidad de medida (7 Kg y no 7Kg), pero no se incluirá dicho espacio entre el número y el signo de porcentaje (7% y no 7 %).

Tabla 1. Ejemplo 1 de tabla para incluir en los artículos enviados a CCD.

	P5	POT	SDT	SDS	SDI	EQG	SDT	ENF
MT	9,1	21,2	9,1	6,1	92,0	63,6	9,0	33,3
ED	33,3	13,3	16,7	6,7	23,0	70,0	16,6	26,7

Leyenda: MT= Indicar el significado de las abreviaturas.

Tabla 2. Ejemplo 2 de tabla para incluir en los artículos enviados a CCD.

Nombre 1	Ítem 1. Explicación de las características del ítem 1 Ítem 2. Explicación de las características del ítem 2 Ítem 3. Explicación de las características del ítem 3
Nombre 2	Ítem 1. Explicación de las características del ítem 1 Ítem 2. Explicación de las características del ítem 2 Ítem 3. Explicación de las características del ítem 3

Discusión. Interpretación de los resultados y sus implicaciones. Este apartado debe relacionar los resultados del estudio con las referencias y discutir la significación de lo conseguido en los resultados. No debe incluirse una revisión general del problema. Se centrará en los resultados más importantes del estudio y se evitará repetir los resultados mostrados en el apartado anterior. Evitar la polémica, la trivialidad y las comparaciones teóricas superficiales. La especulación es adecuada si aparece como tal, se relaciona estrechamente con la teoría y datos empíricos y está expresada concisamente. Identificar las implicaciones teóricas y prácticas del estudio. Sugerir mejoras en la investigación o nuevas investigaciones, pero brevemente.

Conclusiones. Recapitulación de los hallazgos más importantes del trabajo para el futuro de la investigación. En algunos casos, las conclusiones pueden estar incluidas como sub-apartado de la discusión. Sólo deben relacionarse conclusiones que se apoyen en los resultados y discusión del estudio. Debe comentarse la significación del trabajo, sus limitaciones y ventajas, aplicación de los resultados y trabajo posterior que debería ser desarrollado.

Referencias

Durante el texto

– Las citas literales se realizarán en el texto, poniendo tras la cita, entre paréntesis, el apellido del autor (en minúsculas), coma, el año del trabajo citado, coma y la página donde se encuentra el texto: (Sánchez, 1995, 143).
– Si se desea hacer una referencia genérica en el texto, es decir, sin concretar página, a los libros o artículos de las referencias, se puede citar de la forma siguiente: paréntesis, apellido del autor en minúsculas, coma y año de edición: (Ferro, 1995). Las referencias citadas en el texto deben aparecer en la lista de referencias.
– Las citas entre paréntesis deben seguir el orden alfabético.
– Siempre que la cita esté incluida en paréntesis: se utilizará la "&". Cuando la cita no esté incluida en paréntesis siempre se utilizará la "y". Las citas de dos autores van unidas por "y" o "&", y las citas de varios autores acaban en coma e "y" o "&". Ejemplo: Fernández y Ruiz (2008) o Moreno, Ferro, y Díaz (2007).
– Las citas de más de dos autores deben estar completas la primera vez que se citan, mientras que en citas sucesivas sólo debe figurar el primer autor seguido de "et al.". Ejemplo: Fernández et al. (2007). Cuando se citen a dos autores con el mismo apellido, éstos deberán ir precedidos por las iniciales de los correspondientes nombres.
– Cuando el mismo autor haya publicado dos o más trabajos el mismo año, deben citarse sus trabajos añadiendo las letras minúsculas a, b, c... a la fecha. Ejemplo: Ferro (1994 a, 1994 b).

Al final del artículo

Las presentes normas son un modelo abreviado de las establecidas por la APA, 6ª ed. Los autores se ordenan por orden alfabético, con independencia del número de los mismos. Cuando son varios, el orden alfabético lo determina, en cada trabajo, el primer autor, después el segundo, luego el tercero y así sucesivamente. Las citas de varios autores estarán separadas por coma e "&". Algunos ejemplos son los siguientes:

Autor, A. A., Autor, B. B., & Autor, C. C. (1998). Título del artículo. Título de la revista, xx(x), xxx-xxx.

Autor, A. A. (1998). Título del trabajo. Lugar: Editorial.

Autor, A. A., & Autor, B. B. (1994). Título del capítulo. En A. Editor, B. Editor, y C. Editor. (Eds.), Título del libro (pp. xxx-xxx). Lugar: Editorial.

Autor, A. A., Autor, B. B., & Autor, C. C. (en prensa). Título del artículo. Título de la revista.

Autor, A. A., Autor, B. B., & Autor, C. C. (2000). Título del artículo. Título de la revista, xx(x), xxx-xxx. Tomado el mes, día, y año de la consulta en la dirección electrónica.

Además, para la correcta referenciación habrá que considerar:

– Aunque haya dos autores, se pone coma antes de la "&".
– Después de ":" (dos puntos) se empieza con Mayúscula.
– Sólo se escribe en mayúscula la primera letra de la primera palabra del título. Sin embargo, para los títulos de las revistas se capitaliza la primera letra de cada palabra fundamental.

Agradecimientos. Se colocarán en la aplicación en el espacio definido para tal fin.

ARTÍCULOS DE REVISIÓN

Los artículos de revisión histórica contemplarán a modo de referencia los siguientes apartados: introducción, antecedentes, estado actual del tema, conclusiones, aplicaciones prácticas, futuras líneas de investigación, agradecimientos, referencias, y tablas / figuras. Las revisiones sobre el estado o nivel de desarrollo científico de una temática concreta deberán ser sistemáticas y contar con los apartados y el formato de las *investigaciones originales.*

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Esta sección de *Cultura_Ciencia_Deporte (CCD)* admitirá ensayos, correctamente estructurados y suficientemente justificados, fundamentados, argumentamos y con coherencia lógica, sobre temas relacionados con el deporte que tengan un profundo trasfondo filosófico o antropológico que propicie el avance en la compresión del deporte como fenómeno genuinamente humano. Pretende ser una sección dinámica, actual, que marque la línea editorial y la filosofía del deporte que subyace a la revista. No precisa seguir el esquema de las investigaciones originales, pero sí el mismo formato.

CARTAS AL EDITOR JEFE

Cultura_Ciencia_Deporte (CCD) pretende ser un órgano de opinión y discusión para la comunidad científica del área de las Ciencias de la Actividad Física y del Deporte. En este apartado se publicarán cartas dirigidas al Editor jefe de la revista criticando y opinando sobre los artículos publicados en los números anteriores. El documento será remitido al autor del artículo para que, de forma paralela, pueda contestar al autor de la carta. Ambas serán publicadas en un mismo número. La extensión de las cartas no podrá exceder de las dos páginas, incluyendo bibliografía de referencia, quedando su redacción sujeta a las indicaciones realizadas en el apartado de Envío de artículos. Cada carta al director deberá adjuntar al principio de la misma un resumen de no más de cien palabras. El Comité de Redacción se reserva el derecho de no publicar aquellas cartas que tengan un carácter ofensivo o, por otra parte, no se ciñan al objeto del artículo, notificándose esta decisión al autor de la carta. Seguirán el mismo formato que las Investigaciones originales.

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En virtud de lo establecido en el artículo 17 del Real Decreto 994/1999, por el que se aprueba el Reglamento de Medidas de Seguridad de los Ficheros Automatizados que contengan Datos de Carácter Personal, así como en la Ley Orgánica 15/1999 de Protección de Datos de Carácter Personal, la Dirección de *Cultura_Ciencia_Deporte (CCD)* garantiza el adecuado tratamiento de los datos de carácter personal.

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Cultura_Ciencia_Deporte (CCD) will consider research studies related to the different areas of Physical Activity and Sport Sciences, which are scientifically based. Given the specialized nature of the journal, have no place in it for simple popular articles, or those limited to exposing opinions and not conclusions based on investigation. Papers should be sent electronically through our website: **http://ccd.ucam.edu**, where the author must register as an author and proceed as indicated by the tool.

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SUBMISSION

Manuscripts must be submitted via **http://ccd.ucam.edu/index.php/revista/login**. In the following link, you can find the help manual for authors in the submission process (http://ccd.ucam.edu/documentos/manual_info_autores-english.pdf). Everything should be typed on paper size DIN A4 and preferably in Times or Times New Roman, 12 points, with single space (including references) and not exceeding 57 lines per page. Margins should be typed at 1 inch (2.54 cm) on the four sides of each page and text must be justified (alignment to left and right). The recommended extension should not exceed 7500 words and 25 pages including figures and tables. The pages must be numbered consecutively with numbers in the lower right corner. Without separation among paragraphs.

- On the first page of the article, the following elements should be presented: title in Spanish and English (both in lowercase), and an abstract of the work in Spanish and English, plus the key words in Spanish and English. By this order, or the opposite if the item is in English. Not include point at the end of the title.
- On the third page will begin the full text article. The main text of the work should begin on separate pages of abstracts, with a clear indication of the paragraphs or sections and with a clear hierarchy of possible sub-paragraphs.
- The first level will be in bold, without tabulating and lowercase.
- The second will be in italics without tabulating and lowercase.
- The third will be in italics, with tabulation and lowercase.

TYPE OF PAPERS THAT CAN BE SUBMITTED FOR EVALUATION IN CCD

ORIGINAL RESEARCH

These are articles that account for an empirical study set in original parts that reflect the steps taken in the investigation.

Title. 10-12 words are recommended. Since it will be shown on the index information, the title should be informative itself and call the attention of potential readers. Title must be concise and excessive length not adding information must be avoided.

Abstract

a) Should reflect the content and purpose of the manuscript.
b) If the paper is reproducing another author´s work, it should be mentioned.
c) The length should not exceed 1200 characters (including blanks), which is equivalent to about 150-250 words.
d) In these 150-250 words should appear: the problem, if possible in one sentence. Participants, identifying the main variables (number, age, gender, etc.), methodology (design, equipment, procedure data collection, full names of tests, etc.). Results (including levels of statistical significance), conclusions and implications or applications.
e) Key words: 4 or 5 words that reflect what the specific content of the work (in italics and not included in the title). Only the first word is writteyttn with capital. Words separated with commas, and point at the end.

Introduction Problem from the investigation starts, state of the art and point out the aim and hypothesis of the work.

- The research problem should be introduced and substantiated theoretically, describing the experimental approach to the problem. In the last paragraph, the aim of the work should be establishes clearly.
- Use italics to show relevant information. Underline, bold or capital letters are not allowed. The use of abbreviations should be as minimum as possible. In a separate document, the general style guidelines for reporting using the International System of Units are presented.

Method. Description of the methodology used in the research process. This section should be detailed enough to allow the reader to understand all aspects regarding what and how the research has been developed. The description may be abbreviated when well known techniques have been employed in the study. Information about the participants must be displayed to describe their basic characteristics and criteria used for the distribution of participants in any group. The experiment must be reproducible by others and methods, devices, procedures and variables must be detailed. Methods used by other authors should include a reference. Do not forget to describe the statistical procedures. Numbers lower than ten will be as text form, if the numbers are equal to or greater than ten, they will be expressed numerically. This section is usually divided into subsections:

- ***Participants.*** The sample´s characteristics (number, sex, age and other relevant characteristics in each case) and the selection process must be presented. Moreover, in studies involving humans or animals is mandatory to identify the ethical committee that approved the study.
- ***Instruments.*** Specify technical characteristics.
- ***Procedure.*** Summarize each step carried out in the research: instructions to the participants, groups, and specific experimental manipulations. If the study involves more than one experiment, describe the method and results of each of them separately. Numbered, Studio 1, Studio 2, etc.

Results. The results must be presented as accurately as possible. The discussion of them will be minimal at this part. The results may be presented in the text, tables or figures. The tables are a summary of words or numbers arranged in rows or lines. Do not include the same information in the text, tables or figures. Figures and Tables will be introduced in the text where appropriate, with their corresponding numbers (by the legend of the figures at the bottom and the legend of the tables at the top). Use the minimum number of figures and tables as possible show simple tables. Keep simple tables without vertical lines (e.g., Table 1 and Table 2). The font size in the tables may vary depending on the amount of data that includes, and can be cut up to 8 cpi maximum.

To report statistical data, abbreviations should be in italics, as well as when using the *p*-value (which will be always in lowercase). For example: *p, F, gl, SD, SEM, SRD, ICC, ICC*. It is necessary to include a space before and after the equal sign (=). A space must be included also between the number and the unit of measure (not 7Kg and 7 Kg), but the space between the number and the percent sign is not included (7% and 7% do not).

Table 1. Example table 1 to include articles sent to CCD.

	P5	POT	SDT	SDS	SDI	EQG	SDT	ENF
MT	9,1	21,2	9,1	6,1	92,0	63,6	9,0	33,3
ED	33,3	13,3	16,7	6,7	23,0	70,0	16,6	26,7

Note: P5= Write the meaning of abbreviations.

Table 2. Example table 2 to include articles sent to CCD.

Name 1	Item 1. Explanation of the characteristics of the item 1 Item 1. Explanation of the characteristics of the item 2 Item 1. Explanation of the characteristics of the item 3
Name 2	Item 1. Explanation of the characteristics of the item 1 Item 1. Explanation of the characteristics of the item 2 Item 1. Explanation of the characteristics of the item 3

Discussion. It is an interpretation of the results and their implications. This section should relate the results of the study with references and discuss the significance of what has been achieved in the results. A general review of the problem must not be included. The discussion will be focused on the most important results of the study and avoid repeating the results shown in the previous paragraph. Avoid controversy, triviality and comparisons theoretical surface. Speculation is appropriate if it appears as such, is closely related to the theory and empirical data, and is expressed concisely. Identify theoretical and practical implications of the study. Suggest improvements in the investigation or further investigation, but briefly.

Conclusions. Summarize the most important findings of the work for future research. In some cases, findings may be included as a subsection of the discussion. Only conclusions supported on the results of the study and discussion must be presented. The significance of the work, its limitations and advantages, application of results and future lines of investigation should be presented.

References

Through the text

- The literal references will be made in the text, after being reference in parentheses, the author's last name (lowercase), coma, the year of the cited work, eat and page where the text: (Sanchez, 1995, 143).
- If you want to make a generic reference in the text, ie without specifying page, books or articles from the references, may be cited as follows: in parentheses the author's name in lowercase, comma and year of publication: (Ferro, 1995).
- References cited in the text should appear in the reference list.
- The references included in the same parentheses should follow the alphabetical order.
- Whenever the reference is included in parentheses: the "&" will be used. When the reference is not included in parentheses, always will be used "and". The references of two authors are linked by "and" or "&", and references from various authors end up in a coma plus "and" or "&". Example: Fernandez and Ruiz (2008) or Moreno, Ferro, and Diaz (2007).
- References of more than two authors should be complete when it is first mentioned, while in subsequent citations should appear only the first author followed by "et al." Example: Fernandez et al. (2007).
- When citing two authors with the same name, the initials of the relevant names must precede them.
- When the same author published two or more jobs in the same year, their work should include adding the lowercase letters a, b, c. Example: Ferro (1994, 1994b).

At the end of the manuscript – References list

Authors are listed in alphabetical order, independently of the number. When various authors are listed, the alphabetical order is determined in each work by the first author, later the second, later the third and successively. References of various authors will be separate by a comma and "&". Some examples are the next ones:

Author, A. A.; Author, B. B., & Author, C. C. (1998). Title. Journal, xx(x), xxx-xxx.

Author, A. A. (1998). Title. City: Publisher.

Author, A. A., & Author, B. B. (1994). Title. In A. Editor, B. Editor, & C. Editor. (Eds.),

Book title (pp. xxx-xxx). City: Publisher.

Author, A. A.; Author, B. B., & Author, C. C. (in press). Title. Journal.

Author, A. A.; Author, B. B., & Author, C. C. (2000). Title. Journal, xx(x), xxx-xxx. Taking month, day and year when the electronic address was consulted.

In addition, for the correct referencing:

- If there are two authors, add comma before "&".
- After of ":" (colon) begins with a capital.
- Just type in uppercase the first letter of the first word of the title. However, titles of the journals are capitalized the first letter of each key word.

Acknowledgments. They must be placed in the application in the space defined for this purpose.

REVIEW ARTICLES

Historical review articles should use the following sections as a reference: Introduction, Background, Current state of subject, Conclusions, Practical applications, Future lines of research, Acknowledgments, References, and Tables/Figures. Reviews on the status of a issue should be systematic and have the same sections and style from original research.

ESSAYS

This section of *Cultura_Ciencia_Deporte (CCD)* is dedicated to critiques and constructive evaluations of any current subject matter in the knowledge area encompassed by the journal. It aims to be a dynamic section, current, to dial the editorial and sports philosophy behind the magazine. It does not need follow the pattern of the original research but yes the same format.

LETTERS TO THE EDITOR

The intent of the *Cultura_Ciencia_Deporte (CCD)* is to be a means for opinion and discussion in the science community in the area of Physical Activity and Sport Sciences. In this section, letters that are directed to the Editor In-Chief of the journal that critique articles that were published in previous issues of the journal will be published. The document will also be forwarded to the author of the article so that they can likewise respond to the letter. Both will be published in the same issue. The length of the letters may not exceed two pages, including references, and the norms are the same as those mentioned in the submission section. Each letter to the editor should include a summary of 100 words or less at the beginning. The Editorial Board reserves the right to not publish those letters that are offensive or that do not focus on the article's subject matter. Authors will be notified of this decision.

TREATMENT OF PERSONAL DATA

In virtue of what was established in article 17 of Royal Decree 994/1999, in which the Regulation for Security Measures Pertaining to Automated Files That Contain Personal Data was approved, as well as Constitutional Law 15/1999 for Personal Data Protection, the editorial committee of *Cultura_Ciencia_Deporte (CCD)* guarantees adequate treatment of personal data.

*Manual de ayuda para los revisores en el proceso de revisión de artículos en CCD**

Estimado revisor, su labor es inestimable. Le estamos extraordinariamente agradecidos. Sin su aportación rigurosa, la calidad de los trabajos que se publican en CCD, no sería tal. Es por ello por lo que estamos completamente abiertos a tantas recomendaciones y aportaciones que sirvan para mejorar el ya de por sí complejo proceso de revisión. En esta nueva etapa de CCD tenemos una premisa: agilidad, eficiencia y rigor de los procesos de revisión. Por ello le pedimos que, por favor, plantee valoraciones sólidas y las argumente de forma constructiva con un objetivo principal: mejorar la calidad del artículo (siempre que sea posible). Además, le recomendamos que tenga en cuenta las premisas para los revisores que marca la *Declaración de Ética y Negligencia de la Publicación* que puede ver en el pie de página.

A continuación se presenta un manual, en el que los revisores de la revista CCD podrán seguir paso a paso todas y cada una de las tareas que deben acometer para realizar un proceso de revisión riguroso y que se ajuste a las características de la plataforma de revisión (OJS) y de la filosofía de la revista. Cualquier duda que le surja, por favor, no dude en contactar con los editores de la revista (acluquin@ucam.edu / jlarias@ucam.edu). Todas y cada una de las fases se describen a continuación:

1) El revisor recibe el e-mail de CCD con la solicitud de revisión de un artículo. Debe decidir si acepta (o no) la petición del editor de sección. Para ello, debe clicar sobre el título del artículo dentro de "Envíos activos".

2) Una vez hecho esto, aparecerá una pantalla como la siguiente, en la que el revisor debe seleccionar si hará (o no) la revisión. Si se acepta (o no), aparecerá una ventana automática con una plantilla de correo al editor de sección para comunicarle su decisión. Independientemente de su decisión, el revisor debe enviar este correo electrónico. Una vez la revisión es aceptada el revisor debe cumplir las indicaciones que aparecen en la pantalla siguiente.

3) A continuación debe primero abrir y descargar el fichero del manuscrito; y segundo, abrir y descargar la hoja de evaluación de CCD que puede encontrar en el apartado "Normas de revisor" (parte inferior en el epígrafe 1). La revisión y todos los comentarios que el revisor realice deberán plasmarse en esta hoja de evaluación (nunca en el texto completo a modo de comentarios o utilizando el control de cambios). Con ambos documentos descargados se procederá a la revisión propiamente dicha. Es muy importante que el revisor conozca las normas de publicación de CCD, para proceder de forma exhaustiva. Si bien los editores en fases previas del proceso de revisión han dado visto/bueno al formato del artículo, es importante que se conozcan las normas a nivel general para poder evaluar el artículo con mayor rigurosidad.

4) Una vez completada la revisión y rellenada la hoja de evaluación puede escribir algunos comentarios de revisión para el autor y/o para el editor. El comité editorial de CCD recomienda no introducir comentarios específicos en estos apartados. De utilizarse (pues no es obligatorio) se recomienda que hagan una valoración global del artículo, en la que se utilice un lenguaje formal.

5) A continuación debe subir el fichero con la hoja de evaluación del manuscrito actualizada. En este apartado únicamente se debe subir un archivo con la correspondiente evaluación del artículo. No se olvide de clicar en "Subir" o de lo contrario, a pesar de haber sido seleccionado, no se subirá el archivo, y el editor de sección no podrá acceder a él.

6) Por último, se debe tomar una decisión sobre el manuscrito revisado y enviarla al editor. Para ello debe pulsar el botón de enviar el correo, ya que de no ser así el correo no será enviado. Las diferentes opciones de decisión que la plataforma ofrece son las que puede ver en la pantalla. En el caso de considerar que "se necesitan revisiones" o "reenviar para revisión" llegado el momento, el editor se volverá a poner en contacto con usted y le solicitará empezar con la segunda (o siguientes rondas de revisión), que deberá aceptar y volver a empezar el proceso tal y como se explica en el presente manual. Caso de aceptar o rechazar el manuscrito, el trabajo del revisor habrá terminado cuando informe al editor de sección de esta decisión, tal como se ha indicado anteriormente (correo al editor mediante la plataforma).

En la segunda y siguientes rondas de revisión, el revisor se encontrará con dos archivos: uno con el texto completo del manuscrito, en el que el autor ha modificado con otro color distinto al negro en función de las aportaciones sugeridas; y otro fichero adicional con la planilla de evaluación, en la que el autor ha respondido punto por punto en un color distinto al negro, a todas las aportaciones que usted le hizo. Por favor, compruebe que todo está correctamente modificado. Caso de no producirse, responda en la misma hoja de evaluación con tantos comentarios considere, para que el autor pueda "afinar más" y realizar las modificaciones de forma satisfactoria y rigurosa. Este proceso se repetirá tantas veces como los editores de sección consideren oportuno.

Una vez completada la segunda (o siguientes rondas de revisión) del manuscrito, se volverá a tomar una decisión sobre el mismo, y se procederá de la misma manera que en la primera ronda. Una vez se da por finalizada la revisión doble-ciego del manuscrito, desaparecerá de su perfil de revisor, en el que encontrará 0 activos.

Antonio Sánchez Pato
Editor-jefe
(apato@ucam.edu)

* Se puede acceder a una versión ampliada de este manual en la siguiente url: http://ccd.ucam.edu/index.php/revista/pages/view/revisores

RESPONSABILIDADES DE LOS REVISORES

1) Los revisores deben mantener toda la información relativa a los documentos confidenciales y tratarlos como información privilegiada.
2) Las revisiones deben realizarse objetivamente, sin crítica personal del autor.
3) Los revisores deben expresar sus puntos de vista con claridad, con argumentos de apoyo.
4) Los revisores deben identificar el trabajo publicado relevante que no haya sido citado por los autores.
5) Los revisores también deben llamar la atención del Editor-jefe acerca de cualquier similitud sustancial o superposición entre el manuscrito en cuestión y cualquier otro documento publicado de los que tengan conocimiento.
6) Los revisores no deben revisar los manuscritos en los que tienen conflictos de interés que resulte de la competencia, colaboración u otras relaciones o conexiones con alguno de los autores, empresas o instituciones en relación a los manuscritos.

*Info for reviewers in the review process for articles in CCD**

Dear reviewer, your work is essential. We are remarkably grateful. Without your rigorous contribution, the quality of the papers published in CCD would not be the same. That is why we are completely open to recommendations and contributions that can open the already complex process of revision. In this new stage of CDD we have a premise: agility, efficiency and the exactitude of the revision process. Thus, we please ask you solid ratings, and argue constructively with one main objective: to improve the quality of the article. In addition, we recommend you to consider the premises that denotes the Statement of Ethics and Publication Malpractice that can be observed in the footer.

Below a manual is presented, where the CCD journal reviewers are going to be able to follow step by step the process in order to perform a rigorous review process that fits the characteristics of the review platform (OJS) and the philosophy of the journal. Any questions that may raise, please do not hesitate to contact the publishers of the journal (acluquin@ucam.edu / jlarias@ucam.edu). Each and every one of the steps are described here:

1) The reviewer receives the e-mail of CCD with the request for revision of an article. You must decide whether to accept (or not) the request of the "Section Editor". For this, you must click on the title of the article under "Active Submissions".

2) Once this is done, a screen like the following one is going to appear in which the reviewer must select whether will (or not) review the article. If accepted (or not) an automatic window appears with a template email to the Section Editor to communicate its decision. Regardless its decision, the reviewer must send this email. Once the revision is accepted, the reviewer should follow the directions that appear on the screen below.

3) The next step is to open and download the file of the manuscript; and second, open and download the evaluation sheet that can be found under the "Reviewer Guidelines" (in the section 1). The review and any comments that the reviewer makes, should be written in the evaluation sheet (not in the full text as a comment). It is very important that the reviewers knows the CCD publishing standards in order to proceed exhaustively. When the editors accept the format of the article, it is crucial that the reviewers know the general rules, to assess more rigorously the article.

4) After completing the revision and filled the evaluation sheet, you can write some review comments to the author and/or publisher. The CCD editorial committee recommends not to introduce specific comments on these sections. If it needs to be used (not required) make an overall assessment of the article, using a formal language.

5) The next step consists of uploading the manuscript evaluation sheet updated. Here, you only need to upload a file with the corresponding evaluation of the article. Make sure you first click on "select file" and then on "upload".

6) Eventually, a decision on the manuscript must be taken and send it to the Editor. Thus, it is needed to press the button to send the email because if not it will not be sent. The different options that can be chosen appear in the screen below. In the case of considering "revisions required" or "resubmit for review", the editor will get in touch with you and ask you to start with the second round (or further rounds), having to accept and start the same process that has been explained. If the manuscript is accepted or declined, the reviewer´s job will be over, informing the Section Editor by email.

In the second and subsequent rounds of review, the reviewer will find two files: one with the full text of the manuscript in which the author has modified with another colour different to black depending on the contributions suggested, and another additional file with the evaluation form, where the author has responded point by point in a different colour to black all contributions that the reviewer made. Please, check that everything is correctly modified. If not, answer the same evaluation sheet with the considered comments, so that the author can "refine" and make the changes in a satisfactory and rigorous way. This process will be repeated as many times as the Section Editors consider appropriate.

Once the second (or subsequent rounds of revision) of the manuscript is completed, a new decision will be made, and proceed in the same way as in the first round. Once ends the double-blind review of the manuscript, it will disappear from your reviewer profile, where you will find none "Active Submissions".

Antonio Sánchez Pato
Editor-in-chief
(apato@ucam.edu)

* You can see an expanded version of this manual at the following url: http://ccd.ucam.edu/index.php/revista/pages/view/revisores

RESPONSIBILITIES OF THE REVIEWERS

1) Reviewers should keep all information relating to confidential documents and treat them as privileged.
2) The revisions must be made objectively, without personal criticism of the author.
3) Reviewers should express their views clearly with supporting arguments.
4) Reviewers should identify relevant published work that has not been mentioned by the authors.
5) Reviewers also should draw the attention of Editor-in-chief about any substantial similarity or overlap between the manuscript in question and any other document of which they are aware.
6) Reviewers should not review manuscripts in which they have conflicts of interest resulting from competitive, collaborative, or other relationships or connections with any of the authors, companies, or institutions connected to the manuscripts.

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