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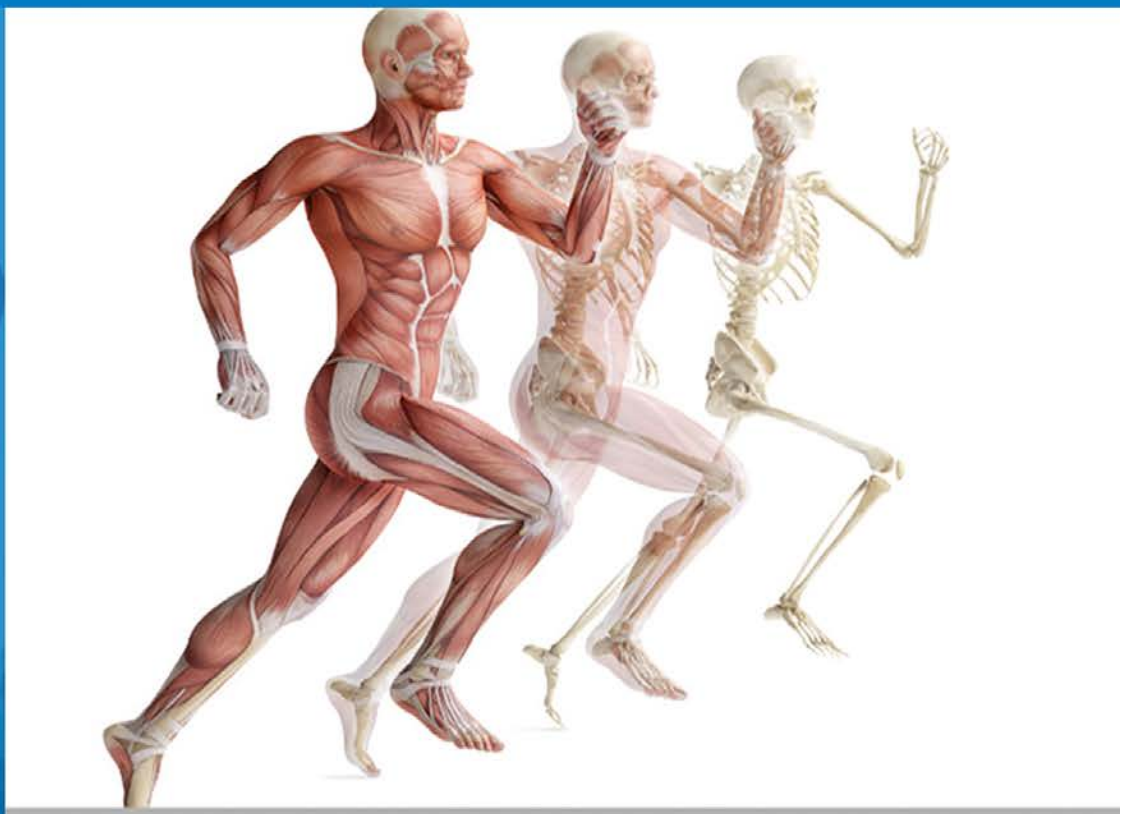

9TH INTERNATIONAL CONFERENCE ON STRENGTH TRAINING

ICST

CONFERENCE PROCEEDINGS

EJSS - Journal
Sport & Exercise Sciences

9th International Conference on Strength Training

23th - 25th October 2014, Abano Terme (PD), Italy

CONFERENCE PROCEEDINGS

Organized by:

Department of Biomedical Sciences

University of Padova - Italy

Edited by:

Antonio Paoli & Keijo Häkkinen

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Welcome

UNIVERSITÀ DEGLI STUDI DI PADOVA

ICST 2014

On behalf of
the School of Human Movement Sciences and the Department of Biomedical Sciences,
we are happy to WELCOME YOU! to the 9th International Conference on Strength Training.

We are honored to host this prestigious event and this important and active group of investigators coming from the fields of: sport sciences, exercise physiology, nutrition science and sport medicine. The ICST 2014 conference provides an outstanding scientific program that emphasizes the current state of knowledge in strength training. In more details, ICST 2014 conference includes advancements in strength training for athletes, but also for special populations and the benefits arising for performance and health. Selected topics cover different fields from autophagy and muscle physiology to training techniques and nutrition. The conference will feature ten invited keynote speakers.
In total more than 100 abstracts have been submitted from 23 countries.
The spirit of this international event is to provide a professional development, learning from experts, sharing of experiences, networking with peers and stimulate the advancements of knowledge in our fields. This multi-disciplinary approach of ICST provides useful information for clinical and health professionals as well as coaches and athletes.
We are sure that participants will help us to make the program an exciting scientific opportunity!
Enjoy your visit in Abano Terme, where you'll be able to find hot springs and mud baths with water of a temperature of 80°C. This beautiful city is located in the Veneto Region and you will also be able to visit Venice and Padova both very beautiful and historic Italian cities.

Prof. **Antonio PAOLI** MD BSc
Chair, Local Organizing Committee

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23th - 25th October 2014, Abano Terme (PD), Italy

PROGRAM

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Program 23th

08.30 Registrations
09.30 **Opening ceremony**

Neural adaptations to strength training
Chair Carlo Reggiani

10.00 **Adaptations in the nervous system during strength and power training**
Timothy Carroll

10.40 **Neuromuscolar adaptations to power training in different sport events**
Robert Newton

11.20 Coffee break

11.35 **Non-defended poster presentations**
Poster Session P1: Abstract ID 20 - ID 60

12.35 Lunch

Mechanisms of skeletal muscle growth control
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13.30 **Autophagy and muscle hypertrophy in strength training**
Marco Sandri

14.10 **Skeletal muscle plasticity**
Carlo Reggiani

14.50 **From myosin to barbell: the long way to hypertrophy**
Antonio Paoli

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15.45 **Abstract based oral presentations**

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Neuromuscular adaptations to traditional versus eccentric-overload resistance training

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Strength training improves muscle cellular outcomes in men during androgen deprivation therapy for prostate cancer: a randomized controlled trial

Vegge et al (Norway)
Acute effects of vibration on muscle activation during high and low loading

16.15 **Oral presentations**

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The effect of grip width on the sticking region in bench press

Ruotsalainen et al (Finland)
Supraspinal contribution to central fatigue induced by hypertrophic resistance exercise

Methenitis et al (Greece)
Muscle fiber conduction velocity, fiber type composition and rate of force development in power-trained individuals

Van Roie et al (Belgium)
Strength training at high versus low external resistance in older adults: long-term muscular and functional adaptations

Stojanović et al (Serbia)
Effects of Low-Load, Elastic Band Resistance Training on strength in elderly women

17.30 **Closing activity**

Program 24th

Strength and edurance: friends or enemies and when?
Chair Steven Fleck

08.30 Neuromuscular adaptations during combined strength and endurance training: the role of different modes of combined training
Keijo Häkkinen

09.10 Enhancing endurance performance through strength and power training
Inigo Mujika

09.50 Coffee break

10.05 Non-defended poster presentations
Poster Session P2: Abstract ID 61 - ID 91

Training for maximal strength and power
Chair Keijo Häkkinen

11.05 How to optimize periodization of strength training for maximal strength gains and muscle hypertrophy
Steven Fleck

11.45 Improvement of strength skills in a military fitness training with and without the use of a tochastic resonance preparation
Dietmar Schmidtbleicher

12.25 Sport specific assessment of strength and power
Dusan Hamar

13.05 Closing activity

14.00 Social activity (trip to Venice)

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Program 25th

Nutrition and strength training
Chair Dusan Hamar

09.00 **Nutritional strategies to support the adaptive response to prolonged strength training in strength and power athletes: effects of age**
Luc Van Loon

09.20 **Effect of selected nutrients on skeletal muscle hypertrophy**
Giuseppe D'Antona

09.40 **Abstract based oral presentations**
Session openers:
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Zeißler et al (Germany)
Effects of glucose metabolism by six-month strength training vs. endurance training vs. Combination strength and endurance training on type 2 diabetics

Nordengen et al (Norway)
Effects of ingesting different whey protein fractions after resistance exercise on the ubiquitin-proteasome system

10.10 **Oral presentations**

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Cortis et al (Italy)
Acute Effects of Suspension Training on Strength and Power Performances

Taipale et al (Finland)
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Kristiansen et al (Denmark)
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10.50 Coffee break

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Avery Faigenbaum

11.45 **Changes in muscle size, architecture and strength with strength training in older age**
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13.25 Lunch

Gender difference in strength training response
Chair Antonio Paoli

14.30 **What are the limiting factors in optimizing physiological adaptations to strength training in men and women?**
William J. Kraemer

15.10 **Closing ceremony and call for 2016 conference**

15.30 Guided tours of Palazzo del Bo
Included the anatomical theatre (the world's first permanent anatomical theatre) and also the Galileo Galilei's Aula Magna (with the podium used by Galileo itself), the Sala dei Quaranta (The "Hall of the Forty") and the Aula di Medicina (where lectures on medicine were originally given) - Only on request (booking compulsory).

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Young Investigator Award

ICST (YIA) - 2014

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ICST 2014 - YIA

Young Investigator Award

In occasion of the 9th International Conference of Strength Training (ICST 2014), Young scientists have the opportunity of competing for the YIA, presenting their research projects to the ICST Conference.

A jury consisting of the ICST scientific committee will evaluate all presentations coming from young scientists, and the best poster and the best oral presentation, will be awarded.

In this occasion TECHNOGYM, is providing two Wellness Ball™ – Active sitting, an innovative product useful both for comfortable sitting and core muscle strengthening.

Best Poster ICST-2014

Best Oral Presentation ICST-2014

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KEYNOTE SPEAKERS

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ADAPTATIONS IN THE NERVOUS SYSTEM DURING STRENGTH AND POWER TRAINING

Timothy J Carroll[1], *Victor Selvanayagam*[1,2], *Stephan Riek*[1], *Aymar de Rugy*[1,3]

[1]Centre for Sensorimotor Performance, School of Human Movement Studies, The University of Queensland, Australia
[2]Sports Centre, University of Malaya, Malaysia
[3]CNRS, Institut de Neurosciences Cognitives et Intégratives d'Aquitaine, Université de Bordeaux, France

Thursday, 23th *Keynote speaker*

There is compelling evidence that strength training causes physiological changes in the central nervous system, but our understanding regarding the mechanistic details and functional implications of these adaptations remain rudimentary.

In this presentation, I will propose that strength training can induce nervous system changes that are analogous to those typically associated with sensorimotor learning. I will focus on research involving non-invasive brain stimulation, which indicates that strength training changes the responsiveness of the neural pathways between the motor cortex and the muscles. Some of these changes appear to facilitate patterns of muscle coordination reinforced during training, and may underlie early performance gains.

However, neural adaptations to strength training may also induce behavioural effects that are relevant for sporting and clinical applications, including biases in movement direction towards those reinforced during training.

From a performance perspective, the key questions that remain to be addressed include the influence of different training parameters on the nature of resulting adaptations, and the degree to which adaptations influence the neural control of movements beyond the gym.

A deeper understanding of how the brain responds to high intensity exercise will be critical to improving the functional utility of rehabilitation and athletic training.

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NEUROMUSCULAR ADAPTATIONS TO POWER TRAINING IN DIFFERENT SPORT EVENTS

Robert U. Newton[1]

[1]ECU Health and Wellness Institute, Edith Cowan University, Australia

Thursday, 23th *Keynote speaker*

Effective and efficient production of very powerful ballistic movements requires the coordination and integration of numerous neural and intra muscular mechanisms optimising the quantity and timing of force production. Within the muscle cells are highly adaptable characteristics such as fiber type and protein expression, calcium kinetics, and ATPase concentration. At the next structural level muscle architecture in terms of fibre and fascicle length, MTU stiffness, pennation angle and cross sectional area dictate range of functional unit shortening, velocity of shortening, and force production. Muscle contraction is controlled by neural factors of motor unit recruitment, size principle, firing frequency and rate coding, stretch and Golgi tendon reflexes, motor unit synchronization, and coordination of agonist, antagonist and synergist muscle actions. Each of these mechanisms while integrated into the resulting ballistic action can be quantified and modified as distinct qualities, a process termed performance diagnosis. Every sport event requires certain neuromuscular qualities to be "tuned" so as the athlete is equipped with the best "machine" to take into competition. Of great importance, this "machine" must be resilient so that it can tolerate the rigours of training as well as competition.

To be powerful an athlete must be strong. Powerful movements such as jumping or throwing require the application of high forces, which are developed from rest to maximum activation over very short time periods but also are maintained while the muscle is undergoing rapid shortening. The ability to develop high force is neuromuscular strength and is dictated predominantly by muscle cross sectional area. As such, achieving and maintaining muscle hypertrophy is high priority for athletes for whom powerful ballistic movements are important for performance and sporting success. However, increasing and maintaining muscle size is a considerable challenge in sports requiring high cardiorespiratory endurance in particular during the competitive season.

However, muscle size and strength alone does not guarantee the athlete will be fast and powerful as other morphological and neural mechanisms exert considerable moderation of how the force capacity of the muscles can be expressed. Specific training methodologies and sequencing is required to optimise the characteristics of the neuromuscular system at critical times in the competition schedule.

Testosterone is a hormone of great importance to both male and female athletes and which can be manipulated to peak strength and power performance. The genomic effects are well established in terms of growth and recovery however the non-genomic effects on the neural system, muscle contraction kinetics, as well as psychological aspects of aggression, motivation, confidence, cognition and memory can have significant influence over the athlete and their capacity for both training and competition.

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AUTOPHAGY AND MUSCLE HYPERTROPHY IN STRENGTH TRAINING

Marco Sandri [1,2,3,4,5]

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[2]Department of Biomedical Sciences, University of Padova, 35121 Padova, Italy.
[3]School of Kinesiology and Health Science, and the Muscle Health Research Center, York University, Toronto, Canada.
[4]Neuroscience Institute, Consiglio Nazionale delle Ricerche, Padova, Italy.
[5]Telethon Institute of Genetics and Medicine (TIGEM), 80131 Napoli, Italy.

Thursday, 23th *Keynote speaker*

Physical activity has been recently documented to play a fundamental physiological role in the regulation of autophagy in several tissues.

It has also been reported that autophagy is required for exercise itself and for training-induced adaptations in glucose homeostasis.

These autophagy-mediated metabolic improvements are thought to be largely dependent on the activation of the metabolic sensor PRKAA1/AMPK.

However, it is unknown whether these important benefits stem from systemic adaptations or are due solely to alterations in skeletal muscle metabolism.

To address this we utilised inducible, muscle-specific, atg7 knockout mice that we have recently generated.

Our findings indicate that acute inhibition of autophagy in skeletal muscle just prior to exercise impacts on muscle strength but not on PRKAA1 activation or glucose homeostasis.

We also reveal that autophagy is critical for the preservation of mitochondrial function during damaging muscle contraction.

We also establish that basal oxidative stress plays a crucial role in mitochondrial maintenance during normal physical activity.

Therefore, autophagy is an adaptive response to exercise that ensures effective mitochondrial and protein quality control during physical activity.

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SKELETAL MUSCLE PLASTICITY

Carlo Reggiani

University of Padova, Italy

Thursday, 23th *Keynote speaker*

Human skeletal muscles are composed of a variety of highly specialized fibers whose selective recruitment allows muscles to fulfill their diverse functional tasks. On the basis of contractile performance and metabolism three major fiber populations can be identified:

- slow, fatigue resistant fibers with low mechanical power output and very active aerobic metabolism;
- fast and quickly fatiguable fibers with high mechanical power output and predominant glycolytic metabolism;
- fast intermediate fibers which combine high power output and resistance to fatigue.

The selective recruitment of different populations of fibers offers a complete range of performance from short duration and high power contractions to long lasting activity with minimal fatigue. The properties of skeletal muscle fibers, however, are fixed for all their life, but can change to adapt the muscle performance to a permanent or long lasting variation of functional demand. The adaptive changes of muscle fibers can occur in response to variations in the pattern of neural stimulation, loading conditions, availability of substrates and hormonal signals.

The new functional conditions can be detected by multiple sensors, from membrane receptors for hormones and cytokines, to metabolic sensors, which detect high-energy phosphate concentration, oxygen and oxygen free radicals, to calcium binding proteins, which sense variations in intracellular calcium induced by nerve activity, to load sensors located in the sarcomeric and sarcolemmal cytoskeleton.

These sensors trigger cascades of signaling pathways, which may ultimately lead to changes in fiber size and fiber type. Changes in fiber size reflect an imbalance in protein turnover with either protein accumulation, leading to muscle hypertrophy, or protein loss, with consequent muscle atrophy. Changes in fiber type reflect a reprogramming of gene transcription leading to a remodeling of fiber contractile properties (slow-fast transitions) or metabolic profile (glycolytic-oxidative transitions).

While myonuclei are in post mitotic state, satellite cells represent a reserve of new nuclei and can contribute to the adaptive response.

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FROM MYOSIN TO BARBELL: THE LONG WAY TO HYPERTROPHY

Antonio Paoli

Department of Biomedical Sciences, University of Padova, Italy

Thursday, 23th *Keynote speaker*

Adaptive changes of muscle fibers can occur in response to variations in the pattern of neural stimulation, loading conditions, availability of substrates, and hormonal signals These signals stimulate pathways which may lead to changes in fiber size and/or fiber type. Fiber size is in a dynamic equilibrium between protein accumulation (hypertrophy) and protein loss (atrophy). The paradigmatic human model for these changes is bed rest for atrophy and resistance training (RT) for hypertrophy. Regarding bed rest we have recently demonstrated that average fibre CSA showed a decrease in both groups, which was followed, during rehabilitation by a recovery to initial values in the young but not in the elderly group. Average isometric force underwent to a decrease during the bed rest period without any increase during the rehabilitation period suggesting some changes in the contractile mechanism. On the other side, one of the major issue regarding the effects of RT on muscle mass is the extreme complexity of such kind of exercise. Resistance training may be carried out via different methods that have been shown to have differing effects on muscle metabolism and signaling pathways. Recently our group has demonstrated the different effects of circuit training carried out at low or high intensity on some anthropometric and metabolic variables. As a matter of fact a resistance training program is a composite of several important variables including: 1) muscle action used, 2) type of resistance used, 3) volume (total number of sets and repetitions), 4) exercises selected and workout structure (e.g., the number of muscle groups trained), 5) the sequence of exercise performance, 6) rest intervals between sets, 7) repetition velocity and 8) training frequency that could be taken into account.

For this reason we have investigated the effects of two different kind of RT on muscle signalling. 12 healthy and physically active subjects performed in two different moments and with different legs an high intensity resistance training (HIRT) and traditional resistance training (TRT). HIRT consisted in 2 sets at the leg extension performed with the following technique: 6 repetitions, 20 seconds rest, 2/3 repetitions, 20 secs rest, 2/3 repetitions with 2 min 30secs rest between the sets. TRT consisted of 4 sets of 15 repetitions with 1 min 15 secs of rests between the sets. Biopsies from the vastus lateralis were taken one week before training (Tb) sessions, immediately after training (T0), 6 hours after (T6) and 24 hours after (T24). Western blot analysis was performed to investigate mTOR, Akt, 4EBP1, S6, AMPK and ACC. Our results showed that different RT execution affects muscle pathways in a specific manner. These results, together with those obtained from bed rest, suggest that variations in RT execution may result in different stimuli affecting muscle hypertrophy.

References

- Brooks NE and Myburgh KH. Skeletal muscle wasting with disuse atrophy is multi-dimensional: the response and interaction of myonuclei, satellite cells and signaling pathways. Front Physiol. 2014 Mar 17;5:99
- Paoli A et al. High-Intensity Interval Resistance Training (HIRT) influences resting energy expenditure and respiratory ratio in non-dieting individuals. J Transl Med. 2012 Nov 24;10:237.
- Paoli A et al. Lift weights to fight overweight. Clin Physiol Funct Imaging. 2014 Feb 24.
- Paoli A. Resistance training: the multifaceted side of exercise. Am J Physiol Endocrinol Metab. 2012 Feb 1;302(3):E387.
- Sandri M et al. Signalling pathways regulating muscle mass in ageing skeletal muscle: the role of the IGF1-Akt-mTOR-FoxO pathway. Biogerontology. 2013 Jun;14(3):303-23.

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NEUROMUSCULAR ADAPTATIONS DURING COMBINED STRENGTH AND ENDURANCE TRAINING: THE ROLE OF DIFFERENT MODES OF COMBINED TRAINING

Keijo Häkkinen

Department of Biology of Physical Activity, University of Jyväskylä, Finland

Friday, 24th *Keynote speaker*

Typical strength training leads to improved strength of trained muscles primarily due to neural adaptations and muscle hypertrophy, while aerobic training enhances endurance performance. However, the magnitude and time course of performance adaptations to combined strength and endurance training may differ depending on the volume and duration of the training period as well due to the different modes of combined training.

Although physiological stimuli directed to the neuromuscular system as a result of strength and endurance training are divergent in nature, combined training may not impair adaptations in strength, muscle activation or hypertrophy induced by strength training over short-term periods or when the volume and/or frequency of training is medium or low.

However, high volume combined training will lead to interference in strength gains, not usually during initial weeks of training, but a plateau will be reached after continued training and followed later on even by decreased strength (Hickson 1980). Running interferes more than cycling with strength gains in combined training (Wilson et al. 2012). When the volume of combined training was diluted by a longer time period using low frequency training (Häkkinen et al. 2003), concurrent training for 21 weeks resulted in large strength gains accompanied with muscle hypertrophy and maximal voluntary activation.

However, even this type of low frequency concurrent training led to interference in explosive strength and rapid voluntary muscle activation. Strength and endurance can be trained on different days or during the same session in two different orders, strength first followed by endurance or vice versa.

Training order of combined training had no specific effects on biological adaptations leaving thus the exercise order up to personal preference (Schumann et al. 2014). However, since in the early phase of training recovery of the group starting with endurance was prolonged, caution should be paid when performing large volume and/or high frequency training. In addition, neural adaptations of trained muscles may be compromised and large inter individual variation also in strength development may occur, if the endurance/strength order is utilized for rather a long period (Eklund et al. 2014).

Large inter individual variation may take place also in the gains of the ratio of strength and endurance performance especially over prolonged combined training despite the order of combined training. In endurance athletes, both maximal and explosive strength training performed concurrently with endurance training will improve strength, power, and muscle activation of trained muscles.

A mixture of maximal and explosive strength concurrently with endurance training seems to be

beneficial for both male and female endurance athletes (Taipale et al. 2014).

Combined endurance and strength training in endurance athletes also seemed to prepare them for increased endurance training volume and coincided with improvements in measures of aerobic performance including running economy (Taipale et al. 2010). Combined strength and endurance training in endurance athletes and in untrained persons usually do not interfere with endurance performance development.

References

- Eklund et al. Int. J Sports Med 2014, Sep 26, Epub ahead of print.
- Häkkinen et al. Eur J Appl Physiol 89, 42-52, 2003.
- Hickson Eur J Appl Physiol 215,255–263, 1980.
- Taipale et al. Int J Sports Med, 28, 468-476, 2010.
- Taipale et al. JSC 28, 689-699, 2014.
- Schumann et al. Eur J Appl Physiol 114, 867-880, 2014.
- Wilson et al. JSCR 26, 2293-2307, 2012.

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OPTIMIZING PERIODIZATION OF STRENGTH TRAINING FOR MAXIMAL GAINS AND HYPERTROPHY

Steven J. Fleck

Department of Kinesiology, University of Wisconsin-Eau Claire, Eau Claire, Wisconsin, U.S.A.

Friday, 24th *Keynote speaker*

Periodization of weight training is the manipulation of acute training variables over time in an attempt to bring about optimal training adaptations. Maximal strength gains and increased hypertrophy are desired training adaptations for many periodized resistance training programs. Both strength/power periodization, also termed linear periodization and daily nonlinear periodization, also termed undulating periodization, cause gains in maximal strength and hypertrophy.

To date the majority of research indicates similar gains in maximal strength and hypertrophy due to these types of resistance training periodization. Number of sets performed is an important consideration no matter what type of periodization is utilized. Meta-analyses indicate multiple sets result in greater increases in maximal strength and hypertrophy than single set programs and that there is a dose response to the number of sets performed for these training outcomes.

Although there is a dose response to the number of sets performed there are responders and nonresponders to resistance training no matter how many sets are performed. There are however fewer nonresponders as the number of sets performed increases.

Order of exercise also affects training outcomes. Large muscle group exercises result in an increased acute hormonal response compared to small muscle group exercises. When small muscle group exercises are performed after large muscle group exercises there are significant greater increases in maximal strength and muscle hypertrophy compared to when only the small muscle group exercises are performed. This increased response when large muscle groups are performed prior to small muscle group exercises is hypothesized to be due to the hormonal response caused by the large muscle group exercises performed prior to the small muscle group exercises.

Whether or not sets are performed to failure may also affect training outcomes. Performing sets to failure compared to not performing sets to failure may result in smaller gains in maximal power, but may not have an effect on maximal strength gains. Performing sets to failure does result in a greater acute hormonal response compared to not performing sets to failure. The greater acute hormonal response could be hypothesized to result in increased hypertrophy.

This information is useful when planning a periodized resistance training program with the goal of maximizing increases in strength and hypertrophy.

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EFFECTS OF SELECTED NUTRIENTS ON MUSCLE HYPERTROPHY

Giuseppe D'Antona

Department of Molecular Medicine and CRIAMS Voghera, University of Pavia, via Forlanini 6, 27100 Pavia Italy

Saturday, 25th *Keynote speaker*

Dietary supplementations have been extensively used to promote skeletal muscle hypertrophy in various physiological and pathological conditions with uncertain success. In fact a large number of variables significantly impacts on the muscular outcome of nutritional supplements, as nutrients type, their possible combination, the timing of administration and the duration of treatment, as well sex, age and genotype of the subjects to be supplemented. These major limitations have prompted researchers to investigate the effects of nutrients supplementation in much controlled setting as the exercise-induced muscle injury paradigm both in animal models and in humans.

During high intensity exercise, cycles of repetitive eccentric and concentric contractions represent a fundamental source of mechanical stress for the active skeletal muscle and this process is a fundamental step for the arising of exercise-induced hypertrophic response as it is followed by muscle remodeling and plastic adaptation.

Clinically speaking the damaging exercise stimulus is followed by a series of out of phase events first represented by decreased muscle strength followed by acute inflammation and soreness and the appearance of circulating indicators of sarcolemmal damage such as creatine kinase.

These events mirror the fundamental steps of muscle regeneration following injury which includes inflammatory reaction dominated by the invasion of macrophages, the activation, differentiation and fusion of satellite cells, the maturation of newly formed myofibers, and remodeling of regenerated muscle. Interestingly nutrients as creatine, branched chain amino acids, and vitamin D, which share anabolic effects at least on myotubes by modulating Akt/mTOR signaling pathway, have the potential to amplify the hypertrophic/regenerative response to a stimulus such as an eccentric damage.

Despite these promising evidences, further studies are required before these supplements could be considered efficacious and safe in chronic settings of intervention based on the combination of exercise and nutritional supplementation and aiming at counteracting atrophic diseases and sarcopenia of ageing.

Indeed further rigorous studies are required to understand which mechanisms limit the hypertrophic response to nutrients and whether the ageing process per se may represent one of these limitations.

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STRENGTH TRAINING IN CHILDREN: NEW PERSPECTIVES AND FUTURE DIRECTIONS

Avery D. Faigenbaum

Department of Health and Exercise Science, The College of New Jersey, Ewing, New Jersey, USA

Saturday, 25th *Keynote speaker*

A compelling body of evidence indicates that strength training can be a safe, effective and worthwhile method of conditioning for children provided the program is age-related, technique-driven, and supervised by qualified professionals.

The ability of children to adapt to the stimulus of strength exercise is influenced by the physiological plasticity at each stage of development in addition to the design of the training program. Global health recommendations aim to increase the number of youth who participate in strength training activities, yet modern day youth are not as active as they should be and reductions in physical activity tend to start early in life. A contemporary corollary of the sedentariness among youth is a lower level of muscular fitness and motor skill performance.

Children who do not enhance their muscular fitness may be less likely to gain confidence and competence in their physical abilities and more likely to have disease risk factors and experience adverse health outcomes.

A youth physical development model that emphasizes muscular strength development early in life is needed to provide a logical and evidence-based approach to maximize long-term development and promote well-being. Without developmentally appropriate interventions characterized by education and instruction, inactive youth will be ill-prepared to become motorically competent adults. New insights have highlighted the potential value of addressing exercise deficits early in life and integrating physically effortful and mentally engaging strength and conditioning activities into youth programs.

Integrative neuromuscular training is a conceptual training model that is designed to enhance muscle strength, improve movement mechanics and help children gain confidence in their physical abilities while participating in a program that includes variety, progression and proper recovery intervals.

In addition to considering the dose-response of physical activity, enjoyment, instruction and quality of the movement experience need to be considered when designing youth programs.

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CHANGES IN MUSCLE SIZE, ARCHITECTURE AND STRENGTH WITH RESISTIVE TRAINING IN OLD AGE

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Saturday, 25th *Keynote speaker*

Resistance training (RT) is commonly regarded as the most effective method for reversing age-related muscle loss (sarcopenia) and weakness (Hakkinen et al. 1998; Narici et al., 2005). Traditional RT involves lifting and lowering a constant external load, thus de-recruitment of motor units (MUs) naturally occurs during the load-lowering, eccentric phase.

While a number of studies reported considerable strength gains after traditional RT in older adults (Macaluso & De Vito, 2004), only few showed improvements in response to pure eccentric RT. Out of these, the most significant is that of Lastayo et al (2003) who used backward cycling to maximise eccentric loading (avoiding de-recruitment of MUs) and showed the superiority of pure eccentric RT to traditional RT in enhancing muscle mass and strength in older individuals.

This potential superiority of eccentric RT compared to traditional RT in combating sarcopenia and weakness in old age, prompted a series of investigations by our Lab to explore the mechanical, structural and molecular mechanisms of such adaptations. We first compared the morphological and functional changes to 14 wk 3 times/week of pure eccentric RT vs traditional RT in older males aged 65-77 years (Reeves et al. 2009).

The results showed that both ECC and CON RT produced a similar increase in vastus lateralis (VL) muscle size (12%) but with distinctly different VL architectural changes. ECC RT promoted a greater increase in VL fascicle length (20%) than CON RT (8%), while CON RT promoted a greater increase in pennation angle (+35%) than ECC RT (5%).

We then investigated the underlying molecular mechanisms of these findings in a following study (Franchi et al 2014) in young people.

We found morphological adaptations similar to those observed in the older individuals (increase in VL volume of +6% with ECC RT and +8% with CON RT, greater fascicle increase with ECC (12%) than CON (5%) and greater increase in pennation angle with CON (30%) than with ECC RT (5%). An increase in fascicle length is believed to reflect an addition of sarcomere in series (Holly et al. 1980, Seynnes et al. 2007), while an increase in pennation angle should reflect the addition of sarcomere in parallel (Gans & Bock 1965, Kawakami et al. 1993).

Interestingly, while MAPK activation (p38MAPK, ERK1/2, p90RSK) was specific to ECC RT, neither mode affected AKT-mTOR or inflammatory signalling 30 min after exercise.

Hence the present findings do not support the contention that ECC loading leads to greater hypertrophy and strength gains than CON loading, neither in young nor in older individuals.

However, our results show that muscle hypertrophy is obtained through distinctly different architectural adaptations: while ECC RT seems to promote preferential addition of sarcomere in series, CON training seems to promote preferential addition of sarcomere in parallel.

Therefore the main difference in the hypertrophic responses to CON and ECC RT seems to be not in the amount but in the location where sarcomere addition occurs.

This different muscle remodelling induced by CON and ECC RT seems mediated by distinct MAPK responses, specific to the two contraction modes

References

1. Häkkinen K, Newton RU, Gordon SE, McCormick M, Volek JS, Nindl BC, Gotshalk LA, Campbell WW, Evans WJ, Häkkinen A, Humphries BJ, Kraemer WJ. J Gerontol A Biol Sci Med Sci. 1998 Nov;53(6):B415-23.
2. Franchi MV, Atherton PJ, Reeves ND, Flück M, Williams J, Mitchell WK, Selby A, Beltran Valls RM, Narici MV. Acta Physiol (Oxf). 2014 Mar;210(3):642-54.
3. Gans, C. & Bock, W.J. 1965. Ergeb Anat Entwicklungsgesch 38, 115–142.
4. Holly, R.G., Barnett, J.G., Ashmore, C.R., Taylor, R.G. & Mol_e, P.A. 1980. Am J Physiol 238, C62–C71.
5. Kawakami, Y., Abe, T. & Fukunaga, T. 1993. J Appl Physiol 74, 2740–2744.
6. LaStayo PC, Ewy GA, Pierotti DD, Johns RK, Lindstedt S. J Gerontol A Biol Sci Med Sci. 2003 May;58(5):M419-24.
7. Macaluso A, De Vito G. Eur J Appl Physiol. 2004 Apr;91(4):450-72
8. Narici MV, Maganaris C & Reeves N (2005). Scand J Med Sci Sports 15, 392-401.
9. Reeves, N.D., Maganaris, C.N., Longo, S. & Narici, M.V. 2009. Exp Physiol 94, 825–833.
10. Seynnes, O.R., de Boer, M. & Narici, M.V. 2007. J Appl Physiol 102, 368–373.

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9th INTERNATIONAL CONFERENCE ON STRENGTH TRAINING

Thursday, 23th

Oral Presentations 1.1 – 1.8

Chair Prof. **William J. Kraemer**

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NEUROMUSCULAR ADAPTATIONS TO TRADITIONAL VERSUS ECCENTRIC-OVERLOAD RESISTANCE TRAINING

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Session opener ***Thursday, 23th*** *Oral Presentation 1.1*

Eccentric actions are thought to be particularly important to increase muscle strength and size but are often performed at submaximal intensities during traditional resistance training. The aim of the present study was to compare neuromuscular adaptations from eccentric-overload resistance training (EO) to traditional resistance training (TRT).

Methods

Twenty healthy men completed 10 weeks of either EO (eccentric load = concentric load + 40%; n = 10), or TRT (eccentric load = concentric load; n = 10). Subjects trained using the leg press (2-min inter-set rest) and unilateral knee extension (1-min inter-set rest) exercises twice a week for 3 sets of 6RM in session 1 and 3 sets of 10RM in session 2. Maximum unilateral knee extensor performance was assessed using: (i) isoinertial 1RM, (ii) concentric-eccentric repetitions to failure with 75% 1RM, (iii) isokinetic concentric and eccentric torque (30°.s-1), and (iv) isometric torque (110° knee angle). Surface EMG was recorded from the superficial quadriceps during tests, and DXA assessed leg lean mass pre- and post-training.

Results

Increases in 1RM, maximum isokinetic concentric and isometric torque, as well as leg lean mass occurred in both groups. Eccentric isokinetic torque increased in EO only (EO 9 ± 9%, $P < 0.05$ vs. TRT 5 ± 9%, n.s.), which was accompanied by increased EMG amplitude. Significant improvements in the repetitions to failure test also occurred in EO only (EO 45 ± 62% vs. TRT 25 ± 38%).

Discussion

While both training programs led to significant improvements in lower limb maximum strength and muscle mass, only EO elicited increases in eccentric force production and quadriceps muscle activity during maximal eccentric actions. Furthermore, EO led to improvements in the fatigue-resistance test (i.e. 75% 1RM repetition to failure), suggesting that EO may be a more efficient method to train the neuromuscular system for specific training goals.

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STRENGTH TRAINING IMPROVES MUSCLE CELLULAR OUTCOMES IN MEN DURING ANDROGEN DEPRIVATION THERAPY FOR PROSTATE CANCER: A RANDOMIZED CONTROLLED TRIAL

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Session opener ***Thursday, 23th*** *Oral Presentation 1.2*

Androgen deprivation therapy (ADT) improves life expectancy in prostate cancer (PCa) patients (Bolla, Van Tienhoven et al. 2010), but is associated with side effects in the muscular system. Here, we investigated the effects of strength training during ADT on muscle fibre size (CSA) and regulators of muscle mass. PCa patients receiving (neo)-adjuvant ADT were randomized to 16 weeks of strength training (n = 12) or usual care (n = 11). The strength training program consisted of a full body program performed in three weekly sessions. Muscle biopsies were collected from m. vastus lateralis pre- and post intervention. Primary outcome was muscle fibre CSA, and secondary outcomes were number of myonuclei and satellite cells per fibre, content of androgen receptor- and myostatin in muscle. The muscle fibre CSA increased with strength training (829 µm2, p=0.04), with larger increases in type II fibres (988 µm2, p=0.03) than in type I fibres (669 µm2, p=0.11). Compared to the CG, the number of myonuclei tended to increase in the STG (0.30 vs -0.06, p=0.06) during the intervention.

No change in satellite cell number, androgen receptor or myostatin was observed. Sixteen weeks of strength training in PCa patients during ADT led to increased muscle fibre CSA, mainly in type II fibres.

An increased number of satellite cells per fibre, normally reported during strength training in healthy men, was not observed. The content of androgen receptor and myostatin remained unchanged.

Reference

Bolla M, Van Tienhoven G, Warde P, Dubois JB, Mirimanoff RO, Storme G, Bernier J, Kuten A, Sternberg C, Billiet I, Torecilla JL, Pfeffer R, Cutajar CL, Van der Kwast T, Collette L.

"*External irradiation with or without long-term androgen suppression for prostate cancer with high metastatic risk: 10-year results of an EORTC randomised study.*" Lancet Oncol 11(11): 1066-1073.

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ACUTE EFFECTS OF VIBRATION ON MUSCLE ACTIVATION DURING HIGH AND LOW LOADING

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Session opener ***Thursday, 23th*** *Oral Presentation 1.3*

Some investigators have suggested that the vibration frequency that elicits the highest EMG increase at low loads should dictate the vibration frequency for training at higher loads (1,2,3,4,5). However, to the best of our knowledge the correlation between EMG responses at low and high loads have not been investigated and will thus be the aim of the present study.

17 healthy untrained women (mean ± SD: age 21 ± 2 yrs, height 169 ± 7 cm, body mass 62 ± 9 kg) were randomly exposed to two trails of vibration with a frequency of 31 Hz and two trails of no vibration in the sitting knee extension exercise.

At 1RM loads the EMGpeak values with vibration were higher compared to no vibration condition (50 ± 32%, 32 ± 27%, 24 ± 23%, 27 ± 22 %, for the VM, VL, RF and BF muscles, respectively, all $p < 0.001$).

For all muscles the vibration induced EMGpeak increase was higher for 1RM loads than low loads (all $p < 0.05$) and no correlation was found between vibration induced EMGpeak increases at 1RM loads and low loads (r values ranged from -0.19 to 0.06).

The present results suggest that vibration induced EMG increase at low loads cannot predict the vibration induced EMG increase at maximal loads. Therefore, if the purpose is to identify a vibration stimulus that increases EMG to the highest degree at maximal loads, such loads should be used during the identifying process.

References

1. Cardinale et al., JSCR, 2003; 17: 621-624
2. Hazell et al., APNM, 2007; 32: 1156-1163
3. Krol et al., JSSM, 2011; 10: 169-174
4. Pollock et al., CB, 2010; 25: 840-846
5. Roelants et al., JSCR 2006; 20: 124-129

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THE EFFECT OF GRIP WIDTH ON THE STICKING REGION IN BENCH PRESS

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Thursday, 23th

Oral Presentation 1.4

When performing the bench press at a heavy load a phenomenon called the sticking region occurs. This is a region of the lift in which the pushing force applied by the lifter to the bar is less than the gravity of the barbell, thereby creating a region of deceleration of the barbell and a constraint for performance in the bench press.

The explanation for this region has not been found and the aim of this study was to examine the occurrence of the sticking region by examining how three different grip widths affect the sticking region in powerlifters' bench press performance.

It was hypothesized that the sticking region would occur at the same joint angle of the elbow and shoulder independent of grip width, indicating a poor mechanical region for vertical force production at these joint angles.

Twelve male experienced powerlifters (age 27.7±8.8 years, mass 91.9±15.4kg) were tested in 1-RM bench press with a narrow, medium and wide grip. Joint kinematics, timing, bar position and velocity was measured with a 3D motion capture system.

All participants showed a clear sticking region with all three grip widths, but this sticking region did not occur at the same joint angles in all three grip widths.

These results rejected the hypothesis that the sticking region would occur at the same joint angle of the elbow and shoulder independent of grip width.

It is however suggested that, due to the differences in moment arm of the barbell about the elbow joint in the sticking region, there still might be a poor mechanical region for total force production that is angle specific, but not for vertical force production.

This was suggested to be because that a greater moment arm of the barbell about the elbow joint created greater lateral forces, in some grip widths.

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SUPRASPINAL CONTRIBUTION TO CENTRAL FATIGUE INDUCED BY HYPERTROPHIC RESISTANCE EXERCISE

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Thursday, 23th *Oral Presentation 1.5*

Hypertrophic resistance exercise (HRE) is known to induce central and peripheral fatigue. However, more detailed information about changes in corticospinal excitability and espe-cially about its supraspinal contribution remains to be elucidated.

Eleven subjects participat-ed in an upper arm HRE which included one repetition maximum (1RM) control contrac-tions followed by three 13 RM sets (SET1-3). Transcranial magnetic stimulation was ap-plied during maximal isometric voluntary contraction (MVC) at the end of each set and dur-ing the control contractions to study changes in the corticospinal excitability.

Silent period (SP) was analysed from each MVC contraction. Electrical stimulation was used to measure peripheral changes. MVC was 242.0 ± 63.9 N during control contractions and decreased significantly to 162.6 ± 44.8 N, 138.7 ± 31.0 N after and 127.4 ± 25.5 N after SETs 1 to 3, respectively.

The evoked superimposed twitches during MVC increased significantly whereas the resting twitches decreased significantly over SET1 to SET3, when compared to control contractions. Mean area of the motor evoked potentials (MEP) were 138.7 ± 52.7, 130.4 ± 44.7, 113.1 ± 31.4 % after SETs 1 to 3, respectively. A significant reduction was observed in MEP area between SET1 and SET3, while a simultaneous and significant in-crease was seen in SP.

There were no differences in Maximal M-wave between the condi-tions. The results of this study clearly support the existence of both central and peripheral fatigue during HRE.

In addition, changes in the MEP area suggest that during HRE the cor-ticospinal excitability increases first until supraspinal fatigue takes over, as suggested by in-crease in SP.

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MUSCLE FIBER CONDUCTION VELOCITY, FIBER TYPE COMPOSITION AND RATE OF FORCE DEVELOPMENT IN POWER-TRAINED INDIVIDUALS

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Thursday, 23th

Oral Presentation 1.6

The rate of force development (RFD) relates well with performance in power-demanding activities and it seems to be depended upon several components of the neuromuscular system (Cormie et al., 2011). An essential part of the neuromuscular structure is the system which propagates the action potentials along the muscle fibers, i.e. the muscle fiber conduction velocity (MFCV), which is thought to be linked with the muscle fiber type composition, at least in patients with neuromuscular diseases (Blijham et al., 2006).

However, little is known about the relationship between RFD and MFCV. Aim of the study was to explore the relationship between MFCV, fiber type composition and RFD in power-trained participants. Twelve power-trained males (24±4yrs) performed an isometric leg press test for the assessment of RFD, on a force-platform (1KHz sampling, WP800, Applied Measurements Limited, UK). MFCV was evaluated 20cm from mid patella of the dominant's leg vastus lateralis (VL), with intramuscular microelectrodes at rest, in supine position (stimulation signal set at 0.05ms duration, 1Hz frequency, 2-15mA, filtered between 2kHz-20kHz).

The mean MFCV, type II fibers MFCV, and maximum MFCV of 60±14 fibers per subject were evaluated and used in statistics. On a different occasion, VL fiber type composition and fiber cross sectional area (CSA) of the dominant lower extremity was evaluated with muscle biopsy.

Significant correlations were found between RFD from 40ms to 250ms and (1) all MFCV parameters ($r=0.619$-0.956, $P<0.01$), (2) CSA and %CSA of type II fibers ($r=0.581$-0.931, $P<0.05$). Close correlations were observed between all MFCV parameters and CSA and type II %CSA ($r=0.615$-0.938, $P<0.01$).

These data suggest that MFCV is linked with RFD during explosive actions, most likely because MFCV is related to the size and type of the muscle fibers.

References

Blijham, J. et al. (2006). J Appl Physiol,100(6),1837-1841.
Cormie, P. et al. (2011). Sports Med,41(1),17-38.

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STRENGTH TRAINING AT HIGH VERSUS LOW EXTERNAL RESISTANCE IN OLDER ADULTS: LONG-TERM MUSCULAR AND FUNCTIONAL ADAPTATIONS

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4. Radiology Section, Department of Morphology and Medical Imaging, Faculty of Medicine, KU Leuven, Belgium.

Thursday, 23th

Oral Presentation 1.7

The long-term training benefits of high- and low-resistance exercise in older adults remain poorly understood. We therefore compared the long-term muscular and functional adaptations after high- and low-resistance exercise in 56 older adults (68.0 ± 5.0 years).

The study was designed as a 24-week follow-up of a 12-week resistance training intervention. Subjects were randomly assigned to leg press and leg extension training at either HIGH (2 x 10-15 repetitions at 80% of one repetition maximum (1RM)), LOW (1 x 80-100 repetitions at 20% of 1RM), or LOW+ (1 x 60 repetitions at 20% of 1RM, followed by 1 x 10-20 repetitions at 40% 1RM). The main outcome measures included mid-thigh muscle volume, 1RM, isometric and isokinetic strength, and functional performance. After an initial post-intervention increase in muscle volume and isokinetic strength, follow-up values were no longer significantly different from baseline in any of the groups.

However, post-intervention gains in isometric strength were partly preserved in all groups. For leg press 1RM, the gain from baseline to follow-up was lower in LOW (+12.3±7.3%) than in both HIGH (+34.9±38.3%, p=0.008) and LOW+ (+24.4±17.7%, p=0.031). For leg extension 1RM, the residual gain was lower in LOW (+12.0±5.8%) than in LOW+ (+21.2±18.0%, p=0.011), but similar in HIGH (+15.3±8.8%) compared to LOW (p=0.105).

Most functional performance tests exceeded baseline levels at follow-up, with no difference between groups. To conclude, this study suggests that high- and mixed low-resistance exercise (LOW+) may be similarly effective for counteracting age-related declines in muscle strength and functionality in the long-term.

The study points out that it is time to re-think the high-resistance training philosophy that has gone unchallenged for decades, especially in older adults.

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EFFECTS OF LOW-LOAD, ELASTIC BAND RESISTANCE TRAINING ON STRENGTH IN ELDERLY WOMEN

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2. Center for Health, Exercise and Sport Sciences, Belgrade, Serbia

Thursday, 23th

Oral Presentation 1.8

Muscle weakness, associated with aging, can be improved in elderly cohorts with different resistance training protocols.

The purpose of this study was to examine the effects of low-load, elastic band resistance training on strength performance in elderly women.

Apparently healthy elderly women (N= 15; 74.5±6.6 years, 162.7± 5.54cm 58.8 ± 6.6kg) performed low-load whole-body resistance exercises (2-3 sets, 12-15 repetitions) using an elastic band, 2-3 d/wk for 12 weeks.

The resistance-training program was designed to progressively increase load over time, provided with different levels of elastic bands (Thera-Band).

The muscle strength (handgrip) as well as muscle endurance (30-s biceps curls and 30-s chair sit-ups) were measured before and 3 days after the final training session.

Results revealed that both muscle strength (8%) and muscle endurance (30%, for both tests) improved significantly ($p < .05$ and $p < .01$, respectively) after low-load resistance training regimen, with exceptionally high participant adherence to training sessions (over 95%).

In conclusion, low-load elastic band resistance training improves muscle strength and muscle endurance in elderly women and seems to be viable model to ensure high training session's adherence rate.

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Saturday, 25th

Oral Presentations 2.1 – 2.7

Chair Prof. **Dusan Hamar**

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USE IT OR LOSE IT - IMPORTANCE OF IN-SEASON STRENGTH MAINTENANCE IN ELITE CYCLISTS

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1. Lillehammer University College, 2. Norwegian School of Sports Sciences

Session opener ***Saturday, 25th*** *Oral Presentation 2.1*

Incorporation of strength training into cyclists' preparatory period has lately received increasing attention with frequent observations of positive effects (e.g. 1,3). However, cyclists have a relatively tight race schedule, making it challenging to perform strength maintenance training during the competition season.

The present study investigates the residual effects of 25-weeks strength training after 8-weeks strength training cessation during the beginning of the competition season. Fourteen elite cyclists were randomly assigned to either endurance training combined with heavy strength training [E&S, n=7, 19±1 years, 67.8±7.8 kg, 179±8 cm, VO2max: 77±6 ml·kg-1·min-1] during the 25 week preparatory period or to endurance training only [E, n=7, 20±1 years, 74.3±7.5 kg, 183±9 cm, VO2max: 73±5 ml·kg-1·min-1]. The strength training consisted of four leg exercises (3 x 4-10 RM, 1-2 day·week-1). During the initial 8 weeks of the competition season, both groups performed endurance training only.

Data were assessed for practical significance using magnitude-based inferences (2). It was likely to most likely that E&S had a larger positive impact on maximal aerobic power (Wmax), power output at 4 mmol·L-1 [la-], maximal isometric half squat force, squat jump (SJ) and mean power in 30-s Wingate test (WGT) after the preparatory period than E. However, it was likely to very likely that that the changes in Wmax, SJ, and WGT were lower in E&S during the initial 8 weeks of the competition period than E, while there was an unclear effect on the remaining measurements.

The present findings suggest that important adaptations to strength training are quickly reduced when strength training is terminated and in-season strength maintenance training is recommended to avoid a reduction in measurements like Wmax and WGT.

References

1. Aagaard et al., SJMSS, 2011; 21:298-307
2. Hopkins et al. MSSE; 2009; 41:3-13.
3. Rønnestad et al., SJMSS, 2011; 21:250-259

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EFFECTS OF GLUCOSE METABOLISM BY SIX-MONTH STRENGTH TRAINING VS. ENDURANCE TRAINING VS. COMBINATION STRENGTH AND ENDURANCE TRAINING ON TYPE 2 DIABETICS

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Session opener ***Saturday, 25th*** *Oral Presentation 2.2*

The rapid increase of the incidence-rate of type 2 diabetes mellitus is a global problem (IDF, 2009). Physical exercise plays a central therapeutic role.

METHODS

110 type 2 diabetes patients have been randomised in 4 groups. The intervention groups absolved a supervised training (system with chip cards) for 1 hour twice a week. The first group (GR1) completed a strength endurance circuit training twice a week, the second group (GR2) completed endurance training and the third group combined the half range of the circuit training (GR1) and the other 50% the endurance training of group 2.

Group 4 (WKG) was the waiting control group. Before, after 3 and after the end of the six-month intervention plus the follow-up time 12 and 36 months (retests are approved to 10 years follow-up) the following data have been measured amongst others: haemoglobin, oral glucose tolerance test (1h and 2h), cholesterol, triglyceride, CRP, pulse-wave analysis, carotid analysis, parameters of urine, anthropometric variables, fat cover determined by means of bio impedance, ergospirometry, maximum strength, standardized evaluations of health, lifestyle and physical performance.

RESULTS

6months-drop-out rate was 19 percent. After six-month intervention time the results between the intervention group compared to the waiting control group show a significant reduction of haemoglobin (p=0.021), impaired fasting glucose (p=0.012), plasma glucose after 1h (p=0.027) and after 2h (p=0.026) in OGTT, the subjective estimation of health situation questionnaire EQ (p=0.002) and SF-12 (p=0.040). All mentioned parameters showed no significant difference between the 3 intervention groups.

DISCUSSION

This study shows positive results for a target physical exercise and a research potential for appropriate measures by diabetics.

CONCLUSION

In summary, the patients benefited from the six-month training. There are no significant differences between the 3 intervention groups.

REFERENCES

[1] IDF, Diabetes Atlas 2009 – Prevalence, 1-3, 2009

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EFFECTS OF INGESTING DIFFERENT WHEY PROTEIN FRACTIONS AFTER RESISTANCE EXERCISE ON THE UBIQUITIN-PROTEASOME SYSTEM

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Session opener ***Saturday, 25th*** *Oral Presentation 2.3*

Resistance exercise (RE) and amino acid availability are positive regulators of net muscle protein balance (NB). Whether a person increase muscle mass, loses muscle mass, or remains stable, is dependent on changes in NB over time.

Effects of protein quality and exercise on protein synthetic rate are relatively well studied, but few studies have investigated how protein quality affect changes in protein breakdown rate. Thus, the aim of this study was to investigate the acute effects of ingesting whey protein produced by a filtration technique; native whey, as compared to normal whey (WPC-80; heated and chemically treated), and regular milk (control) on different markers of the protein breakdown system. Twenty-two young men (n=13) and women (n=9) completed a bout of leg press and knee extension, followed by consumption of native whey, WPC-80, or regular milk.

Drinks containing 20 g of protein were consumed 5 minutes and 2 hours after exercise. Muscle biopsies from m. vastus lateralis were sampled at baseline and 1, 3 and 5 hours following exercise and fractionated into different cellular compartments. The biopsy samples were analyzed by Western blotting with antibodies against FoxO3a, MuRF1 and ubiquitin. There was a tendency towards increased nuclear translocation of FoxO3a in all groups, but no difference between groups.

Nuclear levels of MuRF-1 did not change within 5 hours after exercise and there was no difference between groups.

Levels of ubiquitinated proteins from whole homogenate were higher after ingestion of WPC-80 compared to native whey and milk 3 and 5 hours after exercise. Levels of MuRF-1 and ubiquitinated proteins in the cytoskeletal fraction are in process and will be presented at the conference. Further analysis will show whether the differences observed have implications for muscle protein breakdown.

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ACUTE EFFECTS OF HYPERTROPHY-ORIENTED CLUSTER SETS ON WORK, POWER, AND VELOCITY

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Saturday, 25th *Oral Presentation 2.4*

To investigate the effect of rest periods on fatigue, twelve resistance trained males (25.75±5.13 y; 79.27±8.17 kg; 1RM = 1.90±0.23 x body mass) performed 3 sets of 12 repetitions of back squats using 60% 1RM for two different set configurations: traditional sets (TS) where all repetitions within a set were performed in a row, and cluster sets (CS) where 30 seconds of rest was provided after the 2nd, 4th, 6th, 8th, and 10th repetition of each set.

A minimum of 48 hours was required between TS and CS conditions. All repetitions were performed as explosively as possible and 2 minutes of rest were given between each set for both conditions. Force/time data were collected at 1,000 Hz. 2 x 3 (condition x set) repeated measures ANOVAs were performed to determine differences between sets for total work performed (TW), peak concentric velocity (PV), and peak concentric power (PP). There were no significant differences between conditions for TW.

A significant difference between conditions ($p \leq 0.001$) and a condition * set interaction ($p \leq 0.05$) were present for PV. A significant difference between conditions ($p \leq 0.002$) and a condition*set interaction ($p \leq 0.01$) were present for PP. Results indicate that subjects performed similar amounts of TW for each set across all conditions, but the CS condition resulted in a greater PV and PP than the TS condition.

With an increase in PV and PP, but no difference in TW, the maintenance of velocity and power experienced in the CS condition may be attributed to possible recovery experienced during the intra-set rest intervals.

These data show that 30 seconds of intra-set rest after every 2 repetitions within a set can offset the fatigue-induced decreases in power and velocity observed in TS training in a high-volume resistance training protocol, while not effecting TW.

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ACUTE EFFECTS OF SUSPENSION TRAINING ON STRENGTH AND POWER PERFORMANCES

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Saturday, 25th *Oral Presentation 2.5*

Recently, suspension straps (TRX) have become a popular form of resistance training. Although TRX can elicit higher muscle activations with respect to traditional exercises (McGill et al 2014), there is a need of information on acute effects of a TRX training session. The aim of this study was to examine strength and power performances before (pre) and after (post) a 45-min TRX session. Six female college students (Age: 26.0±3.8years; Height: 1.7±0.1m; Weight: 58.4±3.2Kg; BMI: 21.0±1.5) performed Squat (SJ) and Countermovement (CMJ) jumps on a portable force plate.

Evaluations of lower limbs Maximum Voluntary Contraction (MVC) at 90° angle isometric knee extension were performed through a piezoelectric force transducer, and a hydraulic hand dynamometer was used to measure grip strength (HG). MVC and HG were measured in dominant and non-dominant limbs. The CR10 rate of perceived exertion (RPE, Borg 1998) was administered at the end of the TRX session to evaluate the exercise intensity.

Subject rated the TRX session as hard (5.8±2.5). Differences ($p<0.05$) were found in SJ (pre: 21.0±3.0cm; post: 24.3±1.6cm) and MVC in the dominant limb (pre: 352.7±54.9N; post: 329.4±56.2N). No difference was found in CMJ (pre: 25.1±2.2cm; post: 26.2±1.1cm) and MVC in the non-dominant limb (pre: 322.1±53.1N; post: 321.6±57.5N). For HG, differences ($p<0.05$) emerged only with respect to hand dominance with higher values in the dominant hand (pre: 309.0±46.3N; post: 312.3±52.1N) with respect to non-dominant one (pre: 289.4±40.6N; post: 289.4±51.8N).

These findings indicated that female subjects were able to maintain their strength and improve their power at the end of the TRX session.

It is possible to speculate that an exercise-related arousing effect counteracts fatigue effects and facilitates the performance of complex motor tasks such as power performance.

References

McGill SM et al (2014) J Strength Cond Res, 28: 105-116
Borg (1998), Human Kinetics

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ACUTE RESPONSES TO SINGLE-SESSION COMBINED STRENGTH TRAINING AND ENDURANCE RUNNING SESSIONS: MEN, WOMEN, AND THE "ORDER-EFFECT"

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Saturday, 25th

Oral Presentation 2.6

The purpose of this study was to examine the acute responses of force production and oxygen uptake to single-session combined strength and endurance training sessions. Strength training sessions included mixed maximal and explosive exercises for the lower extremities (S, 45min). Endurance running sessions included running on a 200m indoor tract at ~80% of VO2max (E, 60min).

Using a cross-over study design two orders of combined training were examined (ES vs. SE). Subjects included recreationally endurance trained men and women (age 21-45 years, n=12 men n=10 women). Force production of the lower extremities including countermovement jump height (CMJ) and maximal isometric strength (MVC) were measured pre, mid, and post ES and SE. Ground reaction force/time and running economy were measured during E.

MVC decreased significantly in both men (20.7±6.1% ES and 19.3±9.4% SE) and women (12.4±9.3% ES and 11.6±12.0% SE) while CMJ decreased significantly following combined ES and SE in men (4.5±7.0% and 6.6±7.7%, respectively) but not in women (0.2±8.5% and 1.4±7.3% in ES and SE). Stride length decreased significantly in ES and SE men, but no changes in stride-length were observed in women.

Ground reaction times during running in men and women remained unchanged. Performing S prior to E caused a greater increase in ($p<0.01$) oxygen uptake during running in both men and women than when E was performed prior to S.

Heart rate and blood lactate remained similar regardless of combined training session order.

Performing S prior to E increased oxygen uptake during E, which may be explained by a decrease in MVC in both men and women and decreased CMJ and stride length in men and /or an increase in post-exercise oxygen consumption. The order of combined strength and endurance training sessions should be taken into consideration when planning training for special purposes.

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TEST-RETEST RELIABILITY OF MUSCLE SYNERGIES DURING BENCH PRESS

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Saturday, 25th *Oral Presentation 2.7*

The aim of this study was to assess test-retest reliability of muscle synergies during bench press. Twenty-one strength trained males (age 24.5±2.2 years, height 180.6±6.6 cm, body mass 88.8±12.8 kg) completed 3 sets of 8 repetitions at 60% of 3 repetition maximum in bench press in two test sessions separated by 7 days.

Muscle synergies were extracted from surface electromyographic data from 13 muscles, during 21 bench press cycles using non-negative matrix factorization [1]. A muscle synergy is defined to consist of a synergy activation coefficient and a muscle synergy vector.

The synergy activation coefficient represents the relative contribution of the muscle synergy to the overall muscle activity pattern, while the muscle synergy vector represents the relative weighting of each muscle within each synergy. Two muscle synergies accounted for >90% of the overall data variability.

Muscle synergy 1 represented the eccentric phase of the bench press, while muscle synergy 2 represented the concentric phase. The obtained muscle synergy vectors and synergy activation coefficients were compared by computing a cross-correlation function between data from day 1 and day 2.

The correlation of the synergy activation coefficients between day 1 and day 2 were almost perfect (mean r-value for muscle synergy 1 was 0.84±0.22, while it was 0.89±0.13 for muscle synergy 2). For muscle synergy vectors, correlations were strong (mean r-value for muscle synergy 1 was 0.58±0.42, while it was 0.62±0.41 for muscle synergy 2).

The results indicate that the test-retest reliability of muscle synergies during bench press in trained individuals is strong to almost perfect, which is promising for future studies aiming at quantifying the effect of strength training on muscle synergies.

[1] Hug F., Turpin N.A., Couturier A., and Dorel S. Consistency of Muscle Synergies during Pedaling Across Different Mechanical Constraints. Journal of Neurophysiology 2011: 106: 91-103.

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9TH INTERNATIONAL CONFERENCE ON STRENGTH TRAINING

Thursday, 23th

Poster Presentations ID 23 – ID 60

Chairs

Prof. **Carlo Reggiani**, Prof. **Timothy Carroll** and Prof. **Robert U. Newton**

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Poster session P1 ID-23

The effects of strengthening exercises on the hip abduction musculature in professional female basketball players

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The aim of this research was to study the effect of a short-term deep squat skill training on strength and power. Eleven male physical education students with no experience of deep squat training volunteered for the study. The experimental programme consisted of 4 skill training sessions within one week focused on deep squat technique. There was no control group. Maximal isometric strength (ISOmax) and the rate of force development (RFD) of the initial 200 ms of the squat exercise performed at different knee angles (50°, 90°, 140°) were assessed using a force plate two days before and after the training week. The highest values of mean power (Pmax) within the whole deep squat diagnostic set (DS) and the average of all best mean power values achieved at given loads (Pmean) were monitored with an isoinertial dynamometer. Also load mass (m), velocity (v) and range of motion (ROM) were recorded during Pmax and averaged from all Pmean trials. As to results, ISOmax at 50° and 90° increased significantly by 89.5 N ($p<0.01$) and 73.8 N ($p<0.05$), respectively. No significant change of ISOmax was found at 140° (45.6 N). Similarly, statistically significant increases of RFD were registered at 50° and 90° (0.42 N.ms-1 and 0.47 N.ms-1, respectively, $p<0.01$) but not at 140° (0.17 N.ms-1). These improvements at lower knee angles seem to be training-specific adaptations to deep squat skill training. There were no significant changes of Pmax (27.5 W) and related biomechanical parameters ($\Delta m=7.6$ kg; $\Delta v=2$ cm.s-1, $\Delta ROM=2.1$ cm). Increases in Pmean ($\Delta 38.8$ W) and the average velocity ($\Delta v=2$ cm.s-1) were statistically significant ($p<0.01$). The increase in average ROM was not statistically significant ($\Delta ROM=3.2$ cm). Already 4 skill training sessions within one week seem to be sufficient for the improvement of deep squat technique translating into increased strength and power performance.

Poster session P1 ID-24

The effects of strengthening exercises on the hip abduction musculature in professional female basketball players

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The role of muscle strength of the hip has a relationship with knee injuries prevention. The aim of this study was to evaluate the influence of exercise program on hip abduction strength in female basketball players.
Forty-one professional female basketball players (24,6±3 y-o; 70.9±7.4 kg; 178.6±6.8 cm; 22.3±1.7 kg/m2) were divided in two groups: “experimental group” (EG) (n=22) and “control group” (CG) (n=19). EG was involved in a 6-wks training protocol consisting in 4 exercises performed 3 times per week while CG followed their usual physical and technical training.
Subjects were tested at baseline (BL) and at week 6 (W6). Hip abduction muscles strength was measured with a handheld dynamometer (Lafayette Inst., USA). Test were performed in side-lying position in accord with Kendall et al. (1995). A paired T-test and a unpaired T-test were used respectively to assess pre-post differences within groups and between groups. Significant differences were set at $p<0.05$. Results were expressed as mean ± SD. The EG showed significant improvements in hip abduction strength in both right (16,01±1.5 vs 17.1±1.7 in BL and W6 respectively) and left (16.2±2 vs 17.1±2,1 in BL and W6 respectively) limb. The CG did not show any significant difference at W6 compared to BL. No differences between groups were found at BL. After the intervention EG had higher level of hip abduction strength (right 17.0±1.7, left 17.1±2.1) respect to CG (right 16.0±1.3, left 16.9±1.4). This study shows that a 6-weeks training program of 4 exercises performed 3 times per week has a significant influence on the hip abduction strength in professional female basketball players.

References
Kendall et al.(1995)Testing of manual examination. W.B. Saunders

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Poster session P1 ID-25

The effects of neuromuscular training on upper body strength in young students

Authorship:

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Aim of this study is to measure the influence of a trunk and lower limbs neuromuscular training program on upper limbs strength in young students of secondary school.
One-hundred twenty-four students of secondary school (16±2 y-o; 62.9±8.4 kg; 174±7 cm; 20.8±3.1 kg/m2) were involved in a 9-wks protocol consisting of 2 session/week of 1 hour of physical education. All subjects were divided in two groups: 79 in the "experimental group" and 68 in a "control group". neuromuscular program consisted in core endurance, plyometrics and strength exercises with use of body weight, instead the control group performed the normal physical education lessons plane. The program provides trunk and lower limbs activity without exercises for upper limbs. Subjects were tested at baseline (BL) and week 9 (W9). Upper body strength is measured with a hand grip dynamometer. A paired T-test and a unpaired T-test were used respectively to assess pre-post differences within groups and between groups. Results were expressed as mean ± SD. Significant differences were found at $p<0.05$. The experimental group at W9 showed significant improvements in hand grip test with dominant hand. The control group did not show any significant difference at W9 compared to BL. The study shows how a neuromuscular training program, designed for trunk and lower limbs, has a significant influence on the isometric upper limbs strength in young students.

References

1. Sartorio A. et al. (2002) The impact of gender, body dimension and body composition on handgrip strength in healthy children. J. Endocrinol. Invest. 25:431–435.

2. Massy-Westropp et al.: (2011) Hand Grip Strength: age and gender stratified normative data in a population-based study. BMC Research Notes 4:127.

3. Griffin LY, et al.(2005) Noncontact anterior cruciate ligament Injuries: risk factors and prevention strategies. J Am Acad Orthop Surg 2;8:141-150.

Poster session P1 ID-26

The effects of neuromuscular training on vertical jump in young female basketball players

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Aim of this study is to measure the influence of neuromuscular training program on vertical jumps in female young basketball players. Fifty-five healthy regional female basketball players (16±2 y-o; 62.9±8.4 kg; 174±7 cm; 20.8±3.1 kg/m2) were involved in a 9-wks protocol consisting of 3 session/week of 2 hour of basketball practices. All subjects were divided in two groups: 30 in the "experimental group" and 25 in a "control group". The 20 min neuromuscular program consisted in core endurance, plyometrics and strength exercises whereas the control group performed the normal training routine. Subjects were tested at baseline (BL) and week 9 (W9) by Counter Movement Jump (CMJ) and one legged CMJ (Optojump, Microgate, Bolzano, Italy). No significant differences were found at BL in the two groups. At W9, experimental group showed significant improvements in CMJ (ES 0.8) one-legged CMJ right leg (ES 0.8) CMJ left leg (ES 0.6). Regarding the control group we didn't find any significant differences at W9 compared to BL. The study shows how a neuromuscular training program has shown to increase vertical jumps in young female basketball players.

References

1. Anderst,DM. et al. (1994) Med Sci Sports Exerc 26: S31,

2. Hewett TE et al. (2006). Am J Sports Med.: 34:490–498

4. Zazulak BT et al. (2007). Am J Sports Med. 35:1123–113

5. Gal Ziv et al . (2010) 13: 332–339

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Poster session P1 ID-27

Changes in Explosive Strength and Agility after Six Weeks of Plyometric Training in Professional Basketball Players

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Although some studies have focused on the assessment of the training effect of plyometric training (PT) in basketball (Brown, et al., 1986; Matavulj et al., 2001), studies focusing on elite players are missing. The aim of the study was to find out what changes in explosive strength take place after a 6-week PT applied in training units during pre-season. Elite players (n=12; age 24.36±3.9 years; height 196.2±9.6 cm; weight 92.9±13.9 kg) performed PT applied on two days per week. The changes in explosive strength and agility were measured by the Counter Movement Jump Free Arms Test, 2 Step Run-Up Jump Test; the „T" Drill Test and Hexagonal Obstacle Test. The players participated in three measurements. The first was performed on the first day of pre-season, the second was done after terminating the PT and the 3rd six weeks after terminating the PT. A significant effect of the PT was observed only for the Hexagonal Obstacle Test ($p=0.01$). A post hoc analysis revealed a significant increase in test performance between the first and third measurement ($p<0.01$) and between the second and third measurement ($p<0.01$). The results of the study of elite basketball players did not positively support the assumption that plyometric exercises can be an effective tool for the improvement of explosive strength and agility. However, in some players the improvements corresponded to average improvements after PT presented in literature.

References

Brown, M. E., Mayhew, J. L., & Boleach, L. W. (1986). Effect of Plyometric Training on Vertical Jump Performance in High school Basketball Players. Journal of Sports Medicine and Physical Fitness, 26, 1, 1–4.
Matavulj, D., Kukolj, M., Ugarkovic, D., Tihanyi, J., & Jaric, S. (2001). Effects of Plyometric Training on Jumping Performance in Junior Basketball Players. Journal of Sports Medicine & Physical Fitness, 41, 159–164.

Poster session P1 ID-28

The influence of specific training on the plyometric profile

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Sprinting, jumping and change of direction involve the stretch-shorten cycle (SSC) and therefore plyometric training is used to improve these factors. It has been demonstrated that the jumping strategy utilized can influence the biomechanical profile of the exercise and subsequent adaptation. For example, in some cases, it is important to jump as high as possible while in other cases it is important to reduce the ground contact time. Our hypothesis is that the choice of plyometric exercise has to be matched to the desired biomechanical adaptation. Hence we investigated the influence of 8 weeks of different programs on the plyometric profile of recreational athletes. In each of five groups, very specific exercises were selected according to the training objective: ground contact time group (CT, n=9); vertical jump height group (JH, n=9); CT and JH combination group (CT-JH, n=11); JH + strength training group (JH-S, n=9); and control group (CO, n=8). The plyometric profile performed prior to and post training included measures of jump height, contact time, stiffness and reactivity at different bounding intensities. The results demonstrated that JH and JH-S programs were more effective for improving jump height performance (+7-9%; $p<0.005$) compared to insignificant jump height changes in the CT and CO groups. CT-JH was the most effective on the reactivity index (+14%, $p<0.005$) although significant increases (+8%, $p<0.05$) were also observed in CT, JH and JH-S groups. CT was the only group to significantly decrease short contact time (-5%, $p<0.05$). ANOVA analysis revealed significant groups*session effect for jump height ($p<0.01$) and reactivity ($p<0.005$) but not for short contact time. The present study confirms that the principle of specificity is fundamental in plyometric training so the exercise selection should be developed cognizant of intended adaptations. Jump height and reactivity appear to be differentially affected by specific training practices.

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Poster session P1 ID-29

Low muscular strength thresholds for the detection of cardiometabolic abnormalities in adolescents

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Emerging evidence has demonstrated the importance of strength preservation in the protection against cardiometabolic diseases and early, all-cause mortality. What remains to be determined is whether sex-specific cutpoints for "low strength" in the detection of cardiometabolic risk could be established. The purpose of this study was to explore potential sex-specific thresholds of low relative grip-strength in a large cohort (n=1421) of 10-12 year old adolescents. A continuous, cardiometabolic risk score (MetScore) was constructed from the following components: percent body fat, fasting glucose, blood pressure, plasma triglycerides levels, and HDL-cholesterol. An abnormal cardiometabolic phenotype was characterized as ≥90th percentile of the MetScore. Logistic regression and receiver operating characteristic (ROC) analyses were performed to examine the relative odds of the abnormal cardiometabolic phenotype, per every 10% deduction in relative strength (represented by [grip strength/body mass]), as well as to identify a sex-specific, low- relative strength threshold, respectively. Mean relative grip strength was not significantly different between adolescent boys (0.44±0.10) and girls (0.40±0.09) (p=0.06). As a continuous independent predictor, relative strength explained >35% of the variance in the MetScore outcome. Lower relative strength was robustly associated with increased odds of the abnormal cardiometabolic phenotype, such that for every 0.10 decrement of relative strength, there was a 3.7 and 2.4 increased odds (p<0.001) for boys and girls respectively. Potential low-relative strength thresholds ranged from 0.10-0.80 of body mass. In boys, the optimal threshold to detect the abnormal cardiometabolic phenotype was 0.40 (AUC=0.73; 95% CL 0.67-0.77), with sensitivity=86.9 and specificity=59.1. For girls, the optimal threshold was 0.35 (AUC=0.70; 95% CL 0.65-0.75), with sensitivity=77.3 and specificity=63.3. Low relative grip strength is independently associated with higher cardiometabolic risk in boys and girls. These findings bolster the importance of early strength acquisition in childhood, and provide minimum strength capacity thresholds that may be necessary for cardiometabolic health.

Poster session P1 ID-30

Are fatigue effects on bilateral strength deficit muscle specific?

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The bilateral strength deficit (BLD) describes the difference in maximal or near-maximal force generating capacity of muscles when they are contracted alone and in combination with the contralateral muscles. The purpose of the study was to investigate how muscle fatigue influences BLD in two structurally and functionally different lower-extremity muscles. Thirteen young and physically active women (age: 21± 3 yrs) performed 30 maximal concentric bilateral and unilateral knee extensions and flexions on an isokinetic dynamometer. Surface EMG amplitude was measured from m. biceps femoris, m. vastus medialis (VM) and m. vastus lateralis (VL) muscles. In the fresh state, BLD was observed in both knee extensors (-7.8%) and flexors (-11.6%), and was accompanied with significant ($p < 0.05$) BLD in agonists EMG activity. Following fatiguing protocol, bilateral deficits in torque (+1.9%) and agonist EMG activity (VM: -3.4%, VL: +0.1%) disappeared in knee extensors, but remained present in knee flexors (torque: -7.2%; EMG: -11.6%). Co-activation of antagonists had no effect on the magnitude BLD during fresh or fatigue states. In conclusion, the present study revealed two important findings: (1) the existence of BLD during maximal dynamic knee extension and flexion, which was accompanied with the significant bilateral EMG deficits in agonist muscles, and (2) following fatigue, bilateral torque and EMG deficit disappeared in knee extensors, but remained present in knee flexors. These results generally suggest that BLD phenomenon in females is likely mediated by some sort of inhibition in neural drive of agonist muscles, and that the fatigue effects on BLD could be muscle-specific.

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Poster session P1 ID-31

Characteristics of the bilateral isometric rate of force development-time curve of leg extensors in different trained population

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In competitive conditions top level athletes commonly realize movement in the maximal 300 ms time interval. Therefore, all the aspects of directed and specific fitness level should be focused on explosiveness increase (RFD), in the specific time interval in which the movement is realized, i.e. in the early phase of muscle contraction (Ivanović and Dopsaj, 2013). The aim of this work is to assess characteristics of isometric neuromuscular function of leg extensors in the phase of the contraction in which the absolute interval with the highest intensity of force increase was achieved in various trained and healthy male. 72 males from Track and field (N=16), Martial arts (N=17), well-trained students of the Academy for Criminalistic and Police studies (N=12) and Faculty for Sport and Physical Education (N=16), Control group – untrained, physically active, healthy population of the same age (N=11) were performed standardized "isometric leg press" tests. General Significant difference was established between subsamples for the measurement characteristics at the level of Wilks´ Lambda 0.415, F=2.599, p=0.000. Statistically significant difference was also established in all tested contractile sub-fields regarding the function the observed sub-samples of various trained and healthy male. They can be explained with differences in muscle tissue and maximal nervous activation of muscles during the specific training, i.e. adaptation to specific training. The primary findings indicate that evaluating an isometric RFD, with testing protocols as used in the present investigation, has the potential to provide information that could increase training efficiency.

Reference
Ivanović, J., Dopsaj, M. (2013). Reliability of force-time curve characteristics during maximal isometric leg press in differently trained high-level athletes. Measurement, 46 (7): 2146–2154.

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Poster session P1 ID-32

Seasonal variability of isokinetic strength in knee flexors and extensors in soccer players U19

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Strength of knee flexors and extensors is an important factor for both soccer performance and injury prevention. The aim of this study is to evaluate dynamic changes in isokinetic muscle strength of the knee flexors and extensors in soccer players U19 at the beginning and after completing winter preparatory period and at the end of the spring competitive period from the performance and health perspective. The strength of the knee flexors and extensors was measured in players U19 category (n=9; the average age 18,5±0,4 years) on the isokinetic dynamometer IsoMed 2000 in angular velocity 60°·s-1. Measurement was performed in concentric/concentric and excentric/excentric mode of muscle action. Peak torque (PT), conventional H/Q ratio (H/QCON), functional H/Q ratio (H/QFUN) and functional H/Q ratio in range 10-30° of knee flexion (H/QFUN_10-30) were detected. Friedman's ANOVA and Wilcoxon's couple test were used to determine significant changes. There were found significant changes in PT ($p<0,05$) in strength of the knee extensors in the nondominant leg in concentric mode only. No significant differences were found in imbalance of the knee flexors and extensors by H/QCON and H/QFUN ratios. However, significant decrease of the H/QFUN_10-30 ratio in the dominant leg between measurements was found at the beginning and at the end of the winter preparatory period. The main results indicate insufficient ability of hamstrings to stabilize knee joint during extension resulting in increased risk of hamstrings and soft tissue knee injury. Moreover, H/QCON, H/QFUN and H/QFUN_10-30 ratios provides different information about fitness of the soccer players usable for injury prevention.

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Poster session P1 ID-34

Can different percentages of 1rm influence the performance of training volume during exercise with blood flow restriction on lower limb?

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The main use of low intensity exercise combined with blood flow restriction is to provide skeletal muscle hypertrophy. However, how the percentage of 1RM can influence the performance of training volume has yet to be elucidated under this condition. For this purpose, this study investigated how different percentage of 1RM can influence the performance of training volume during exercise with blood flow restriction for lower limb. Six young physically active men (26.3 years) participated of this study. First, the participants performed 1RM of unilateral leg extension (right side). Then, subjects performed two experimental protocols, 30 and 40% of 1RM in 4 sets until concentric failure repetition; the sequences were randomized and executed with 48h interval. The cuff narrow was 15 cm and the pressure was maintained in 100 mmHg. To express the performance we proposed an equation of declined performance (DP) = [(1st set repetitions – 4th set repetitions)/1st set repetitions] x 100. The statistical analysis did not show difference between the analyzed percentages (DP 30%= 64.8±10.4; DP40%= 65.9±8.3; p>0.05). In conclusion, the different percentage did not affect the training volume performance in the unilateral leg extension; we suggest that the training volume should be based on the subject's profile.

Poster session P1 ID-35

Effect of one session strength training on muscle damage and inflammatory responses and compare with plyometric in athlete males

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Resistance machine (RM) exercise and plyometric (P) activities are two common resistance training. Heavy-resistance strength training (HRST) leads to increased levels of contractile muscle strength during isometric, concentric and eccentric muscle actions of maximal voluntary effort. Based on previous studies HRST that have eccentric component were shows induce muscle damage, DOMS, inflammatory responses and performance deterioration (1-3). In another hand, plyometric caused muscle damage, DOMS and inflammatory responses in participants (4-6). But no previous studies have compared muscle damage and inflammatory response between HRST and plyometric. Therefore, purpose of this study was to compare the effect of one session strength training on muscle damage and inflammation with plyometric exercise. Twenty male Taekwondo athletes were randomly assigned to the experimental groups (number of each group = 10). Participants in plyometric group performed deep and side jump (70% of their maximum high jump), and strength training participants performed leg press and leg extension machine (70% of their one-repetition maximum). All variables were measured at baseline, 30 minute pre, post and 24 h after both modes of resistance exercise. Repeated-measures analysis of variance with post hoc analysis revealed circulating leukocyte count, serum creatine kinase, Interleukin-6 and C-reactive protein increased significantly immediately and 24 h after both modes of exercise training and was not different between groups ($p < 0.05$). Results of this study suggest one session plyometric and strength machine training with same intensity (that use for development of muscular power) associated similar muscle damage and inflammation in athletes.

Reference

1. Fatouros I, Chatzinikolaou A, Paltoglou G, et al. Acute resistance exercise results in catecholaminergic rather than hypothalamicpituitaryadrenal axis stimulation during exercise in young men. Int J Biol Stress, 2010; 13(6):461-468.
2. Aboodarda SJ, George J, Mokhtar AH, et al. Muscle strength and damage following two modes of variable resistance training. J Sports Sci Med. 2011; 10:635-642.
3. Barquilha G, Uchida M, Santos V, et al. Characterization of the Effects of one Maximal Repetition Test on Muscle Injury and Inflammation Markers. Webmed Cent Physiol. 2011; 2(3):WMC001717.
4. Chatzinikolaou A, Fatouros IG, Gourgoulis V, et al. Time course of changes in performance and inflammatory responses after acute plyometric exercise. J Strength Cond Res. 2010; 24(5):1389.
5. Tofas T, Jamurtas AZ, Fatouros I, et al. Plyometric exercise increases serum indices of muscle damage and collagen breakdown. J Strength Cond Res. 2008; 22(2):490.
6. Twist C, Eston R. The effects of exercise-induced muscle damage on maximal intensity intermittent exercise performance. Eur J Appl Physiol. 2005; 94(5):652-658.

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Poster session P1 ID-36

Influence of exercise order on muscle activation pattern in upper limb exercises

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Free weight and machine exercises have been used in strength training routine, but there is a lack of research addressed to the different exercise order (EO) and muscular activity pattern. This pilot study analyzed the influence of EO on muscle activity in 5 young recreationally trained subjects. EMG signals of the pectoralis major (PM), anterior deltoid (AD) and triceps brachii (TB) were collected with a NORAXON® device following the SENIAM recommendations, and normalized by MVC. Subjects performed 1 set of 10 repetitions with the load obtained in 10RM tests. Subjects performed four different sequences (SEQA: Barbell bench press (BP), barbell shoulder press (SP) and close-grip barbell bench press (CBP); SEQB: CBP, SP and BP; SEQC: Smith machine bench press (SMBP), smith machine shoulder press (SMSP) and smith machine close-grip bench press (SMCBP); SEQD: SMCGBP, SMSP and SMBP. The results of this study showed the influence of different EO on muscle activity on free weight and machine exercises. PM had greater muscle activity when performed as the first exercise independent of EO (BP - SEQA: 65.85%, SEQB 49.55%, $p < 0.05$; SMBP - SEQC: 51.35%, SEQ D 46.83%, $p < 0.05$). However, the same was not observed for AD (SP - SEQA: 75.45%, SEQB: 50.45%, $p < 0.05$; SMSP - SEQC: 59.78%, SEQD: 65.98%, $p < 0.05$) that showed greater activation during SEQA and SEQD. TB showed no changes in muscle activity in any of the experimental situations. These results suggest that type of exercise (free weight or machine) and EO must be considered when training the muscle groups analyzed in the current study.

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Poster session P1 ID-37

Strength, speed, power and change of direction performance of Indonesian Athletes

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INTRODUCTION: We assessed strength, speed, power and change of direction (COD) performance across gender and sport in Indonesian National level athletes in a range of sports typical of international competition in Asia including Archery, Cycling, Diving, Fencing, Fin Swimming, Football, Hang Gliding, Gymnastics, Judo, Karate, Paragliding, Pencak Silat, Roller Skating, Sailing, Sepak Takraw, Shooting, Sport Climbing, Squash, Swimming, Table Tennis, Tennis, Track and Field, Water Ski, Weight Lifting, Wrestling and Wushu. METHODS: 266 athletes participated in the study, 167 males (height 167.3±6.2cm, body mass 65.0±12.6kg), and 99 females (height 156.3±6.3cm, body mass=53.8±7.8kg). Performance tests included 30m sprint with split times; COD ability through 5-0-5 test to right and left sides (505R and 505L respectively); countermovement vertical jump peak velocity (VJv), peak power (VJp) and peak force (VJf); isometric mid-thigh pull peak force (PFIMTP) and maximal rate force of development (RFDIMTP).The results are reported as mean±standard deviation, statistical significance was set at $p < 0.05$. RESULTS: Sprint split times at 5, 10, 20 and 30m: male 1.15±0.07s, 1.91±0.11s, 3.24±0.19s 4.52±0.29s female 1.27±0.07s, 2.65±0.13s, 3.72±0.25s 5.27±0.40s; 505R and 505L: male 2.64±0.23s, 2.68±0.25s, female 2.93±0.24s, 2.95±0.26s; VJv, VJp and VJf: male 2.81±0.24m*s-1, 3580±694W, 1629±367N, female 2.40±0.18m*s-1, 2330±470W, 1227±217N; PFIMTP and RFDIMTP: male 2065±421N, 5344±2730N*s-1, female 1485±292N, 3153±1531N*s-1. All differences between male and female groups in each sport were statistically significant. DISCUSSION: We believe this the first study to present indicative strength, speed, power and COD performance data on athletes competing at a national level in traditional and Asia specific sports. This may form the basis for benchmarking athlete neuromuscular capacities in the region and in particular provide initial data on highly popular but understudied Asian sports. The comparison between sports and genders may be used to inform strength and conditioning program emphasis and design for these sub-populations.

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Poster session P1 ID-38

Trunk strength characteristics of elite austrian ski racers

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Alpine ski racing requires high physical fitness in all age groups. Core strength of elite athletes is very important in performance and injury prevention. Alpine ski racers must have strong core muscles with balanced trunk flexor and extensor strength to maintain a central position. The aim of this study was to compare core strength and flexion/extension ratios in ski racers with physically active controls. Strength data of 109 elite Austrian ski racers and 47 sport science students were collected. They were measured in concentric isokinetic flexion and extension mode at 150°/s using the CON-TREX TM®. The active range of motion was set at 60°. Differences were analysed by using an unpaired Student t-test. Male ($p<0.001$) and female ($p=0.026$) ski racers were heavier compared to the control group. Similar to previous reports in elite rowers the principal finding was that irrespective of gender, all strength values obtained by elite athletes were significantly higher than those of the control group. Relative flexion ($p=0.003$) and extension ($p=0.001$) peak torque were higher in male ski racers compared to the control group. Female athletes were significantly stronger also in relative flexion force ($p=0.006$) and relative extension force ($p=0.001$). Both groups indicated a quite low flexion to extension ratio (0.50-0.60) on the CON-TREX TM® indicating stronger trunk extensor muscles relative to the flexor muscles with no significant differences between groups or genders. Strength training for legs and core is a focal point for ski racers and this would explain the higher trunk strength values. It has been shown that weak core strength and an imbalanced ratio of flexion to extension strength are predictors for a higher ACL injury risk in competitive alpine ski racers. Future investigations will examine if a weak core is a contributor to the growing problem of low back pain in ski racers.

Poster session P1 ID-39

Rate of force development muscle architecture and throwing performance in young competitive throwers

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Currently little is known about the relationship between throwing performance and the rate of force development (RFD) while it has been suggested that there might be a link between RFD and muscle architecture. Aim of the study was to investigate the relationship between throwing performance, RFD and muscle architecture in young competitive throwers, in different year-round training phases. Six male and 6 female throwers (age 19±5 years, height 172±8 cm, mass 80±21 kg, training experience 5±1 years) completed two mesocycles of 5-wks periodized throwing training before the initiation of the spring competition period. Measurements were performed at the beginning of training (T1), after the first mesocycle (T2) and after the end of the second mesocycle (T3). Measurements included shot put throw (e.g. from the power position), isometric leg press RFD, and vastus lateralis architecture: muscle thickness, fascicle angle, fascicle length (B-mode ultrasound, Sonosite, Bothel, USA). Shot put throw from the power position increased from T1 to T3 (3.72±4.64%, $P=0.011$). RFD increased between T1 and T3, in all time frames ($P<0.05$). Muscle thickness increased from T1 to T3 (5.96±7.17%, $P=0.045$). Fascicle length increased between T1 and T3 (13.41±16.16%, $P=0.013$). Significant correlations were found between RFD and throwing performance at all time points (Pearson's r ranged from 0.511 to 0.917, $P<0.05$). Significant correlations were also found between muscle thickness and throwing performance (Pearson's r ranged from 0.515 to 0.811, $P<0.05$), as well as fascicle length and throwing performance (Pearson's r ranged from 0.546 to 0.683, $P<0.05$). RFD was significantly correlated with muscle thickness (Pearson's r ranged from 0.550 to 0.875, $P<0.05$) and fascicle length (Pearson's r ranged from 0.567 to 0.639). These results suggest that both RFD and muscle architecture are linked with throwing performance.

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Poster session P1 ID-40

Correlation between anthropometric parameters, upper body strength, core strength and shot velocity in professional ice hockey

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Ice hockey is a sport that requires a variety of motor skills. Among skating, passing and handling the puck, shooting is a basic skill in hockey. In an average National Hockey League game about 30 shots per team are fired on the net. Approximately 9% of these shots lead to a goal. In order to improve shooting percentage, on-ice training should include shooting drills and an off-ice conditioning program should improve the physical qualities needed to shoot well. To date there are no investigations which have published the correlation between selected fitness tests and shot velocity in ice hockey. The purpose of this study was to examine the correlation between anthropometric parameters, upper body strength, core strength and shot velocity in ice hockey. 17 professional hockey players volunteered for this study. Upper body and core strength were tested with five fitness tests: bench press 1-RM, bench press power test, isokinetic trunk flexion and extension, handgrip strength and medicine ball toss. Moreover each subject performed a slap shot and a wrist shot to examine shot velocity. To investigate the correlation between fitness tests and shot velocity, Pearson and Spearman tests were used. Significant correlations were detected only between core rotation strength and wrist shot velocity (r=0,654) and between body weight and wrist shot velocity (r=0,561). The influence of the tested physical parameters was less than expected. Shooting technique with body weight transfer and optimal energy utilisation of the stick is more critical than physical fitness in shot velocity in professional ice hockey. When a hockey player winds up, most of his body weight is on his back leg. As the stick swings by, his body weight gradually shifts toward the front leg. This motion, along with the right timing of release, reinforces the player's momentum and gives the puck its speed.

Poster session P1 ID-42

Long-term development of anaerobic fitness in elite Austrian ski racers and its relationship to performance

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The purposes of this study were to investigate the long-term development of anaerobic fitness in Austrian elite female alpine ski racers and to examine if anaerobic fitness was related to racing performance. Eleven female Austrian ski racers were tested prior to the 2010, 2011, 2012 and 2013 International Ski Federation (FIS) alpine skiing seasons. All athletes were on the Austrian ski team, had raced in FIS World Cup races, and 8 had achieved at least a top 10 placing in a World Cup race. The loaded repeated jump test (LRJT) was 2 minutes in duration and consisted of 48 loaded countermovement jumps (LCMJs) with a loaded barbell equivalent to 20% bodyweight. Power (P) was calculated from ground reaction forces, and P for each LCMJ was calculated. The mean P was calculated for the complete test. The FIS ranking at the end of each season for the best event of each athlete was used to determine a group mean for FIS ranking. The mean FIS ranking for the group was 76th in 2010, and improved by 33% to 51st in 2013. The mean P of the total test improved 8.9% over the 4 seasons, from 26.9 ± 3.1 to 29.3 ± 2.6 W.kg-1. A repeated measures ANOVA with 2 factors indicated that anaerobic capacity (mean P) increased over the 4 seasons ($p < 0.05$) but performance based on FIS rankings did not significantly change. There was no significant interaction between the 2 factors of mean P and FIS ranking but the trend was that anaerobic capacity improved together with the FIS ranking. Over the 4 years the athletes improved in their anaerobic fitness as measured with the LRJT, and raised their FIS rankings, but there was no statistically significant interaction between anaerobic fitness and performance over the 4 seasons.

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Poster session P1 ID-43

Minimal Shoes Increase Running Economy

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Though one necessary condition for running shoes is to have a shock absorbing function, barefoot-type minimal shoes which barely have such a function have been widely used recently. The present study aims to compare the running economy between minimal shoes and standard shoes having different weights and shapes and to compare the characteristics of ground contact due to the difference in the shoe shapes. The subjects were 24 novice runners (nine males and fifteen females, ages ranging from 21-61 years; height = 163.8 +/- 8.07 cm; and weight = 57.4 +/- 11.4 kg). The running economy was evaluated from oxygen consumption (mL・kg-1□min-1), which was measured using K4b2 made by COSMED (Italy), while subjects wearing minimal and standard shoes ran at a constant speed of 2.78 m/sec (10 km/hr) on a 400meter track. The difference in the oxygen consumption was compared using dependent t-tests. Regarding the ground contact pattern measurements, OptoJumpNext (made by Microgate Corporation) was installed to measure the ground contact time per step, flight time per step, length of step, frequency of step and speed of step. The oxygen consumption while running at 10 km/hr was 31.76 mL□kg-1□min-1 for minimal shoes, which was significantly smaller than the 32.54 mL□kg-1□min-1 for standard shoes by 2.5% ($P < 0.05$). This indicates that minimal shoes have a higher running economy as compared to standard shoes at a speed of 10 km/hr. The only other difference was that the ground contact time for minimal shoes (0.293 sec) was significantly shorter than for standard shoes (0.303 sec) ($P < 0.05$). Thus, novice runners wearing minimal shoes have a shorter ground contact time and a higher running economy while running at 10 km/hr.

Poster session P1 ID-44

Effect of heavy strength training on running performance determinants and performance in trained female endurance athletes

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Equivocal findings exist on the effect of adding strength training (S) to endurance training on running and cycling performance (1-4). However, the effect of S on running and cycling in the same athletes has not been investigated. We have previously reported improved cycling economy and performance in female duathletes after adding S (5). Here we examine the effect of the S on running economy and performance. Nineteen females (33±8 years, 64±7 kg, VO2max: 53±3 ml·kg-1·min-1) were randomly assigned to either endurance training combined with S [E+S, n=11) or to endurance training only [E, n=8). The S consisted of four leg exercises [3 x 4-10 repetition maximum (RM)], twice a week for 11 weeks. Measurements of maximal force and endurance abilities were performed before and after the intervention. There were no differences between the groups at baseline. E+S increased maximal isometric torque in knee extension by 8.5 % ($p < 0.05$) with no change in E. Body mass was reduced in E (1.4 %, $p<0.05$), with no change in E+S. There were no change in VO2max, running speed at 3.5 mmol·L-1 blood lactate concentration and oxygen consumption at 10 km/h in neither of the groups. Both groups tended to increased running distance during a 40 min all out trail (E+S: 2.0 % $p = 0.06$, E: 2.1 % $p = 0.07$). The addition of S had no effect on running economy and performance in female duathletes. These results contradict results from the same athletes in cycling, where improved cycling economy and 40-min all-out performance were found (5).

References
1. Aagaard et al., SJMSS, 2011; 21:298-307
2. Bishop et al., MSSE, 1999; 31:886-891
3. Millet et al., MSSE, 2002; 34: 1351-1359
4. Ferrauti et al., JSCR 2010; 24: 2770-2778
5. Vikmoen et al., ECSS 2013; Abstract ID 2691

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Poster session P1 ID-45

Maximum speed, peak force, peak power, and throwing distance in medicine ball throw

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Medicine ball exercises have long been adopted in strength and conditioning training program for those sports that require rotational power in the transverse or oblique planes. To the present, a throwing distance has been only measure to evaluate the maximum speed and power produced in medicine ball exercises. However, throwing distance alone seems to be inadequate for correct evaluations of speed and rotational power, because release angle also affects the throwing distance, and the ideal angle and planes of the movements vary based on the sport and the task being performed. The purpose of this study was to evaluate the relationship between maximal speed at the release, peak force, and peak power along with throwing distance with different mass of the medicine balls. 15 active collegiate students performed standing rotational side throws using a newly developed medicine ball containing three-axis accelerometer and gyroscope at the center of the ball ("Ballistic Ball" Assess2Perform, Boulder, CO, USA) weighing 1, 2, 3, 4, and 5 kg. Results showed that throwing distance and maximal speed decreased as mass of the ball was increased. In contrast, peak force was increased with increasing of mass of the balls. Interestingly, inverted U-shape of mass of the ball-peak power relationship was demonstrated with the highest peak power at 4 kg. However, individual difference exists in mass of the ball at which the highest peak power was produced. Although significant correlation between throwing distance and maximal speed was observed, the coefficient of determination was not high enough to explain the maximal speed by the throwing distance. These results suggest that coaches and athletes involved with rotational power sports could obtain more beneficial information to optimize the medicine ball exercises other than throwing distance for improving the performance with the medicine ball used in this study.

Poster session P1 ID-47

Effects of lower extremity neuromuscular training on lower extremity energetics during single-leg landing and knee injury occurrences in female collegiate handball players: A case study

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Improving hip function is reportedly important to prevent knee injuries, especially in women, who have a higher incidence of knee injuries than men. This case study aimed to investigate the effects of lower extremity neuromuscular training on lower extremity energetics during single-leg landing and knee injury occurrences in female collegiate handball players. Seventeen female collegiate handball players underwent lower extremity neuromuscular training for 4 months from preparatory to early competition periods during the season. Before and after training, they performed single-leg landings from a 30-cm box onto a force plate. Biomechanical data were collected with a 3-dimensional electromagnetic tracking system. Sagittal plane relative hip, knee, and ankle joint work during the decelerating phase of single-leg landing was calculated; the pre- and post-training values were compared using paired sample t-test. Participants demonstrated significant increase in hip joint relative work (Right, Left: 0.2 ± 30.4% to 22.9 ± 35.5%, 12.6 ± 30% to 32.2 ± 39.1%) but significant decrease in knee (70.3 ± 39.4% to 53.5 ± 38.5%, 53.5 ± 38.5% to 39.4 ± 25.9%) and ankle (29.5 ± 30.1% to 23.7 ± 26.7%, 34 ± 31.5% to 28.5 ± 35%) joint relative work during single-leg landing in post-training when compared with the pre-training values (All $p < 0.01$). However, even after training, three participants showed remarkably low and large hip (2.8%~6.3%) and knee (64.6%~69.7%) relative joint works, respectively, in one of their legs. Two of these participants sustained serious knee injuries in the leg during the season; one had noncontact ACL injury, and another had third-degree quadriceps strain. No other player had serious knee injuries. The results support the notion that decreased hip functions and quadriceps dominant shock attenuation strategies increase the risk of knee injuries. Future studies should focus on identifying the factors that hinder improvements in hip joint functions.

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Poster session P1 ID-48

Effect of three different implements on muscle activation on bench press

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Bench Press (BP) is a very popular upper-body resistance exercise but there is a lack of information about the muscle activation pattern related to the different implements adopted to perform this exercise. So, the aim of this study is to assess muscle activity on BP using three different implements: smith machine BP (SM), barbell BP (BL), and dumbbell BP (DL). Nineteen trained men (28.05 ± 4.3 years, 172.4 ± 6.01 cm, 80.2 ± 8.9 kg) underwent a randomized and counterbalanced repeated-measures study design; workloads were assessed by 10RM tests. Eletromyographic (EMG) signals of pectoralis major (PM), anterior deltoid (AD) and triceps brachii (TB) were recorded during one set per session for each implement with a NORAXON® (Scottsdale, U.S.A.). Root mean square (RMS) was calculated for each muscle and implement. EMG data was normalized by maximum voluntary contraction and resistance exercises were performed with controlled tempo (2 seconds for concentric and 2 seconds for eccentric phase) and all sets were performed to failure, adopting 2-minute rest interval between sets. Greater AD activation was observed under DL (56.0%) and BL (52.5%) protocols, compared to SM (44.2%). No significant differences were observed for PM (SM: 51.1%, BL: 54.1%, DL: 54.2%; $p>0.05$) and TB (SM: 55.8%, BL: 60.2%, DL: 58.0%; $p>0.05$) muscles. Therefore, these findings suggest that the DL and BL may be interesting alternatives to increase AD activation on bench press.

Poster session P1 ID-49

Multi-modal High-Intensity Interval Training Increases Muscle Function and Metabolic Performance in Females

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High intensity interval training (HIIT) is an extremely time efficient method of improving aerobic and anaerobic power and capacity. Beyond the performance and metabolic benefits observed, however, in most individuals, traditional HIIT (TR-HIIT) using modalities such as cycling, running, and rowing, does not typically result in increased muscle strength, power, or endurance, which are important for optimal function and performance. Integrating resistance training exercises with heavy loads into HIIT has become very popular in commercial exercise programs, but has yet to be adequately studied. The purpose of this study is to compare the physiological outcomes of TR-HIIT with a novel multi-modal HIIT (MM-HIIT) circuit incorporating multiple modalities, (including resistance exercises) within a single session. Thirty two recreationally active, but untrained females (age 24.7±5.4years) were recruited for a six-week training study and randomly assigned to either a TR-HIIT (rowing) or MM-HIIT group. Subjects were tested pre- and post-training on multiple fitness parameters using both field (1RM, squat endurance at 70% 1RM, broad jump) and lab tests (Wingate, VO2max, anaerobic thresholds). Training involved 6 sets of 60 seconds of all-out effort with 3 minutes recovery, performed 3 times per week. After training, MM-HIIT showed similar improvements as TR-HIIT in VO2max (7 vs 5%), anaerobic threshold (13 vs 12%), respiratory compensation threshold (7 vs 5%), anaerobic power (15 vs 12%) and anaerobic capacity (18 vs 14%, respectively). Only the MM-HIIT group had significant increases in squat (39%), press (27%), and deadlift (18%) strength, broad jump distance (6%), and squat endurance (280%). Post testing, MM-HIIT was greater than TR-HIIT for 1RM squat (64.2±13.6 vs. 45.8±16.2 kg), 1RM press (33.2±3.8 vs. 26.0±9.6kg), and squat endurance (23.9±12.3 vs. 10.2±5.6reps, respectively). In conclusion, MM-HIIT training resulted in similar aerobic and anaerobic adaptations as TR-HIIT; however, additionally improved muscle strength, power, and endurance in recreationally active females.

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Poster session P1 ID-50

Comparison of Physiological Outcomes of Multi-modal High-Intensity Interval Training and Strength Training in Adults Over 55

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In older adults, strength training has been shown to be extremely beneficial for maintenance of independent function and health. Strength training, however, has a moderate effect on cardiovascular function and often requires supplemental conditioning methods in order to optimize the cardiovascular benefits of training. High-intensity Interval Training (HIIT) is often prescribed along with strength training as it minimizes the interference effect of concurrent training; however, typically requires increased time for both programs. Combining strength training and HIIT conditioning methodologies, we have developed a novel, time-efficient multi-modal (MM-HIIT) training method; however, the adaptations and outcomes of this method have yet to be tested. The purpose of this study was to compare strength training (STR) with MM-HIIT on physiological, body composition, and performance adaptations. 18 recreationally active, but untrained, men and women over 55 years of age were allotted to one of two training groups and groups were randomized to the STR or the MM-HIIT protocol. Each group trained 3 times per week for 6 weeks, following a 2 week adaptation phase. The STR group performed 6 sets of 6 repetitions every 5 minutes with linear progression of the major lifts (squat, bench press, deadlift) on alternating days. Various assistance exercises (rowing, pressing) were performed for 6 sets of 12 repetitions 30 seconds after the main lift. The MM-HIIT group trained using the same daily movements, but in a 75second 'all-out' work interval (major lift followed by assistance exercise and then by a conditioning finisher for the remainder of the 75seconds) with a 3:45 minute recovery interval for 6 sets. Testing involved lab tests (VO2max, anaerobic threshold, body composition with DEXA, and Wingate) and field tests (functional performance, 3RM deadlift, 4RM bench press, and 80% of 1RM bench press endurance). Full results will be available and presented at the conference.

Poster session P1 ID-51

The effect of maximal resistance training vs. combined resistance/plyometric training on strength and sprint performance in elite women's football.

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The aim of this study was to investigate the effect of, and difference between, two strength-training regimes over 10-weeks in female football players. Eleven players from a Norwegian elite female football club participated in the study and were split into two groups, plyometric (PLY, n=6) and maximum strength (MAX, n=5). Both groups performed two strength-training sessions per week for 10-weeks. MAX performed two maximum strength sessions, and PLY performed one maximum strength session and one plyometric session. Players was tested for 1 repetition maximum (1RM) strength in squat, bench-press and pull-down, in addition to performance in 10- and 30-m sprint, countermovement jump (CMJ) on a force platform, repeated sprint (6x30-m), Yo-Yo intermittent recovery level 1 (Yo-Yo IR1) and muscle architecture measures pre- and post-training. Both groups had a substantial increase in 1RM squat (PLY = 10.4 ± 7.1 kg, effect size (ES) =0.80, MAX = 18.1 ± 7.7 kg, ES=0.80; mean ± 90% confidence limits; CL) and a moderate effect was found between groups, being greater for MAX (ES=0.85, 94% likely). MAX showed an increase in 10-m sprint time (0.04 ± 0.03 S, ES=0.41, 89% likely), but no other meaningful changes were found for sprint or jump tests. A small increase in muscle thickness (PLY = 0.21 ± 0.10 cm, MAX = 0.10 ± 0.21 cm) was found for both groups, however the effect between groups was considered unclear (ES=0.26). An increase in fascicle length was also evident (PLY = 0.60 ± 0.89 cm, MAX 0.43 ± 1.90 cm), but the between groups difference was trivial and unclear (ES=0.19). A trivial difference was found in training load between groups throughout the period (ES=0.17). Both maximum strength- and combined maximum strength and plyometric training increases 1RM performance, but appears to have little effect on sprint and jump performance directly.

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Poster session P1 ID-52

Effect of 6-weeks low-intensity running after power training on jumping performance

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This study investigated the effects of low-intensity running performed immediately after lower-body power training sessions, on the improvement of jumping performance. Nineteen female physical education students (age 21±2 years, height 166±5 cm, mass 57±6 kg) participated in 6-weeks power training, 3 times per week. The first and last session of each week (Monday and Friday), training included 6 sets of 2 repetitions fast eccentric-only half-squats in a Smith machine, with progressively increasing intensity (from 50 to 70% 1-RM). Each set was followed by 3 maximum intensity countermovement jumps (CMJ). Wednesday's session, included only 4 sets of 3 CMJ and 4 sets of 3 drop jumps from 30-40 cm, with maximum intensity. Nine participants completed the power training described above (PT), while the other ten performed the same power training followed by 30 minutes of low-intensity running (PAT), at an intensity corresponding to 60-70% of maximal heart rate. Before and after the training period, CMJ height, heart rate during the modified Bruce treadmill test, and vastus lateralis' fiber type composition and cross sectional area (CSA, muscle biopsy) were measured. Jumping performance was increased after PT (11±6%, P=0.001) but not after PAT (3±7%, ns). Submaximal heart rate remained unaltered with PT (e.g. at the 3rd test phase: 139±16 vs. 142±11 b·min-1, ns) but was reduced after PAT (147±13, vs. 135±11 b·min-1, P=0.01). The CSA of all fiber types was increased after PT (Type I: 17±10%; Type IIA: 15±9%; Type IIX: 16±11%, P<0.05) but not after PAT. Fiber type composition was not altered with either intervention. These results suggest that the addition of 30 minutes low-intensity running after power training impairs the development of jumping performance. This may be partly explained by the lack of increase in fiber CSA after PAT, although neural and muscle architectural adaptations might also have influenced the results.

Poster session P1 ID-53

Physical fitness factors associated with cognitive functions in elderlies certified for long-term care

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This study aimed to investigate the associations between cognitive functions in elderlies certified for long-term care and several physical fitness factors. Sixty-three elderly participants who were certified for long-term care performed cognitive function (CF) tests that assess 5 different aspects of cognitive impairments. The participants were divided into three groups; normal, possible dementia, and dementia, based on the total score of the 5 CF tests. They also performed the timed up and go test (TUG), the FiTRO agility check test (FA), reaction stick test, hand-eye-coordination test, and 30-second chair standing test to assess their physical fitness levels. Mean differences in each variable among groups were assessed using 1-way ANOVA and Tukey's post hoc test. Stepwise multiple regression analyses were conducted with the variables that showed significant differences among groups as dependent variables and five cognitive function scores as independent variables. The dementia group needed a longer time for TUG and FA than the other groups ($p < 0.05$). The possible dementia group needed significantly more time for FA than the normal group ($p < 0.05$). No other variables showed significant differences among groups ($p > 0.05$). Stepwise multiple regression analyses revealed that a lower CF score, which reflects visuospatial function, was associated with a longer FA time ($R2 = 0.229$, $p < 0.01$), while no significant relationship was found between TUG and any CF tests. These results indicate that improving their capacities for walking and quickly moving their lower extremities in reaction to certain stimuli may be important to prevent cognitive impairments in elderlies. However, to improve their lower extremity reaction capacities, it may also be important to improve their visuospatial functions along with improving lower extremity muscle functions. Such approach may also be important to prevent falls in elderlies.

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Poster session P1 ID-54

Effects of intensive plyometric training on bone metabolism, serum hormone concentrations, and maximal power capacity in young pubertal athletes

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In track and field young boys and girls train jumping events and other events in which they do a lot of bounding drills and exercises (plyometrics). In puberty, growth is fast and human body is very sensitive to training responses. Therefore, we examined effects of 8-week intensive plyometric training at the end of preparatory period on bone metabolism, serum hormone concentrations, and maximal power capacity in young competitive pubertal boys (mean ± SD; age 14.0 ± 0.9 yr and girls (14.1 ± 1.0 yr). They had four 1-hour training sessions per week. Two of them were intensive plyometric sessions and two were event skill (long jump, high jump, pole vault and shot put) and sprint (30-60 m) training sessions. In the beginning of the study period, the subjects performed 250 bounding contacts per one training session with a low intensity. Using linear programming, the number of contacts decreased down to 50 performed with a very high intensity at the end of the period. The before and after measurements showed that body mass, counter movement jump, reactive power in jumping, and maximal running speed increased during the study period both in boys ($p < 0.01$-0.001) and in girls ($p < 0.05$ - 0.01) . The concentration of a bone formation marker osteocalcin (Ost) increased ($p < 0.01$) in both genders, whereas a bone resorption marker band 5 tartrate-resistant acid phosphatase (S-TR) did not change. Consequently, Ost/S-TR ratio increased ($p < 0.01$- 0.001) during the period. The concentrations of testosterone (Tes) and cortisol (Cor) increased ($p < 0.01$- 0.001) in both genders, but Tes/Cor ratio did not change. In conclusion, Ost/S-TR ratio can be used to follow balance of bone formation and resorption (anabolic vs. catabolic) during intensive plyometric training period in young pubertal boys and girls.

Poster session P1 ID-57

The SEMG Research Of Jump Serve Air Link Of Chinese Elite Bach Volleyball Player

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Modern Beach Volleyball competition is increasingly fierce, movement technique is relatively stable, competition among elite athletes more reflected on the technical details of the action. SEMG signal is electrical changes in the neuromuscular system to the skin surface and steer, zoom in and make a record and display the resulting one-dimension time series signals. By studying the jump service of the air link of SEMG signal in time domain characteristics, can effectively reflect the measured muscle function and active, to a certain extent, reflect the athlete's technology. In this paper, through the use of SEMG signal and camera test methods for synchronization, 1 Chinese top beach volleyball players jump service of the air link in seven major muscle to conduct on-site testing and analysis, discussion during the jump serve, different muscles at the same time-domain characteristics of surface electromyogram variation. Study results showed that the athletes in the air links, erector spinae muscle, rectus abdominis muscle, latissimus dorsi and Rectus femoris demonstrate a high level of coordination and timing; activities maximum EMG amplitude, duration of the longest, most active, the beach volleyball jump serve training and education provides a theoretical frame of reference.

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Poster session P1 ID-59

Knee Joint Muscle Activity Ratios and Timing during Farmer's Walk Exercise

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Knee stability can be disrupted by muscle imbalance between the vastus medialis (VMO), vastus lateralis (VL) and biceps femoris (BF) during complex movements. Activation of these muscles has been described for squats, lunges and step up exercises but not for Farmer's Walk. Objective of the study was, to investigate the effects of increasing load on the muscle activity ratio and onset of changes in VMO, VL and BF during Farmer's Walk exercise.
Sixteen power lifters performed an isometric test for knee flexion/extension using a dynamometer followed by walking with progressively increasing loads of up to 75% of their body mass (BM). During the isometric tests and Farmer's Walk, electromyography (EMG) data were collected from the VM, VL and BF in both legs together with 3D kinematics.
Significant changes in the activity ratio were found for the VMO/VL ($F3, 93 = 5.92$, $p = .0001$) and VL timing ($F3, 81 = 6.8$, $p = .0004$). Other parameters showed no significant differences. VMO/VL was significantly reduced between the 150% BM (mean ± SD, .89 ± 0.4) and the 175% BM condition (.81 ± 0.3). VL onset was significantly accelerated between the weight-bearing condition (26.11 ± 8%) compare and the 125% BM (19.47 ± 9%), 150% BM (21.21 ± 10%) and 175% BM (15.45 ± 6%) conditions. The VMO/VL ratio and onset is equal when walking under weight-bearing conditions.
Farmer's Walk is an exercise that increases the activity of VL more than the activity of VMO and accelerates the VL action together with the increased load. Farmer's Walk exercise should be compensated by exercises activating VMO, if it is used in strength training session. This finding should also be regarded during reconditioning after knee injuries.

Poster session P1 ID-60

Effects of Core stability training program on dynamic balance in junior tennis athletes

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There are only few studies in literature pertaining tennis athletes, core stabilization and dynamic balance. Both these components are essential for tennis. The purpose of this study was to assess the outcome of a core stabilization training program on dynamic balance (1). The study was a 2x2 factorial design with an experimental and a control group including twenty junior tennis athletes: ten in the experimental group and ten in the control group. In the five-week protocol for the core stabilization training program subjects performed exercises two times a week for a fifteen minute session. Experimental group performed 5 progressive levels of exercises focusing on strengthening the core musculature while maintaining neuromuscular control. Control group completed a traditional training program. All subjects chosen for the study completed a pre and post test measurement of dynamic balance using the Star Excursion Balance Test (SEBT) (2) and trunk muscular endurance using the McGill's tests (3) in addition to the Backward Medicine Ball Throw (BMBT). Tests were conducted a week before after the five-week exercise protocol. The results of the SEBT showed relevant differences among the two groups: in general the experimental group obtained a very significant increment in dynamic balance than the control group. No relevant differences were found in the McGill's tests and the BMBT on both groups and for all the tests in the control group. In conclusion, Core stabilization exercises may be used to enhance dynamic balance in junior tennis athletes.

1) Jeffreys I. Developing a progressive core stability program. Strength Cond J 2002; 24:65-67.
2) Kinzey SJ, Armstrong CW. The reliability of the star excursion test in assessing dynamic balance. J Orthop Sports Phys Ther 1998;27(5):356-60.
3) Okada T., Huxel KC, Nesser TW. Relationship Between Core Stability, Functional Movement, and Performance. J Strength Cond Res 2011;25(1):252-261.

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9TH INTERNATIONAL CONFERENCE ON STRENGTH TRAINING

Friday, 24th

Poster Presentations ID 61 – ID 91

Chairs

Prof. **Steven Fleck**, Prof. **Keijo Häkkinen** and Prof. **Iñigo Mujika**

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Poster session P2 ID-61

Estimation of maximal dynamic half-squat strength by isometric force during squat with different knee angles in power athletes

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The evaluation of leg strength is a prerequisite for the compilation of individualized training programs for power athletes. However maximal isometric tests, instead of maximal (1-RM) squat measurements, are often used to examine changes in leg strength due to the lower risk of injury. This study examined the relationship between 1-RM half-squat performance and maximal force during isometric squat with two different knee angles (90o and 140o). Thirteen power athletes (long jumpers and decathletes, height: 177±5 cm, body mass: 78.7±7.3 kg, fat: 9.1±6.8%) visited our laboratory on 3 occasions in a randomized and counterbalanced order: (a) maximum isometric contraction from a squat position on a force platform with knee angle set at 90o (ISO90) or (b) 140o (ISO140), or (c) maximal dynamic half-squat 1-RM. Reliability of ISO90 and ISO140 was examined during a preliminary visit (ICC=0.97 and ICC=0.98, $p<0.01$). 1-RM was 177.7±26.1 kg (2.26±0.31 kg/kg body mass), while maximal isometric force (minus body weight) at ISO90 and ISO140 was 1780±273 and 3355±786 N, respectively. There was a strong significant correlation between ISO90 and 1-RM ($r=0.97$, $p<0.01$) and a weaker correlation between ISO140 and 1-RM ($r=0.62$, $p<0.05$). The Linear regression predicting 1-RM from ISO90 was: 1-RM(kg)=0.0935x+11.331 ($R2=0.95$, SEE=6.14 kg). These results suggest that in highly trained power athletes, 1-RM half-squat performance can be predicted with high accuracy by maximal force during isometric squat, in an angle-specific manner. These results are in general agreement with previous studies, reporting similar but weaker relationships ($R2<0.58$) in less trained subjects (Blazevich et al., 2002, Demura et al., 2010). The prediction equation developed may be used by coaches and practitioners to predict 1-RM half-squat strength.

References
Blazevich, AJ, Gill, N, Newton, RU. J Strength Cond Res 16: 298–304, 2002.
Demura, S, Miyaguchi, K, Shin, S., Uchida, U. J Strength Cond Res 24: 2742–2748, 2010.

Poster session P2 ID-62

Increase strength and muscular power in the context of physical education classes

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The main aims of this study are to observe: if motor capacity strength and muscular power, in general, improve in the school context; if the implementation of a strength training programme has greater gains than in normal PE classes and which gains strength expressed by boys and girls with similar strength-training programme.
The study involved two groups of 12sc graders from Monção secondary school. It consisted of 91 participants who were allocated: a control group (CG) with 28 students and an experimental group (EG) with 68 students (♀=40; ♂=28).
The process implied the execution of the following tests: 60” push-ups, 30” curl-ups, 2kg medicinal ball throws, 30m runs, static horizontal and sextuple jumps. The strength training programme consisted of a set of callisthenic exercises with short dumbbells: calf raises, lunges, half squats, bench press, butterfly, vertical row, swing with kettlebell, abdominal and lower back (2 sets of 15 repetitions at ca. 60% 1RM and/or 30” of exercise and 30” rest). These exercises were carried out twice weekly and the training program lasted 9 weeks.
The percentages gains are the following: curl-ups 9,3vs15,2%; push-ups 11,1vs33,3%; medicinal ball throws 6,8vs17,9%; horizontal jumps -3,3vs29,2%; sextuple jumps -1,5vs5,1% and 30m runs -1,7vs3,9% in all the tests between the 1st and 2nd moments of assessment. In the EG, the gains are statistically significant in all of our evaluation tests however the CG also had significant improvement in curl-ups and push-ups which were evidenced. Although the EG showed better changes in all the tests, only in the curl-ups, push-ups, MB throws and sextuple jumps had have sufficiently greater gains which statistically differentiate it from the CG.
The comparative analysis of the results obtained by boys and girls of EG show that both have identical gains, just one test (MB throws) of the boys showed significant better results.
This study demonstrated that PE classes can induce improvement both in strength and muscular power in these male and female students. It is also true that the organization of physical education lessons whenever focused on the importance of a strength training plan develops even more evident gains.

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Poster session P2 ID-65

Hypertrophic signaling is restored after a ten-day break between two blocks of high frequency blood flow restricted resistance exercise (BFRRE).

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A massive increase in myofiber area following three weeks of high frequency BFRRE was recently reported(1). Notably, the increase was evident already after the first five-days of training, whereas no further increase in myofiber area occurred during the last 2 weeks of training. No further increase in fiber areal could be due to a saturation of the physiological systems responsible for sensing the training stimulus. Consequently, the aim was to investigate whether a ten-day rest period could reset hypertrophic signaling after five days of high frequency BFRRE.
Nine subjects completed seven training sessions of BFRRE in five days, had ten days of rest before they again completed seven sessions in five days. The western blot technique was used to measure the phosphorylation of the signaling proteins p70S6K and p38MAPKγ 1 hour after the first training session in both training weeks. Biopsies were also measured for muscle fiber area using a fluorescence microscopy.
Phosphorylation of p70S6k increased at both time points, with no difference from each other. p38MAPKγ phosphorylation increased in week one, but not in week two and phosphorylation tended to be greater in week one. Muscle fiber area increased in type I, but not in type II fibers.
Phosphorylation of p70S6K has previously been linked to the hypertrophy observed with BFFRE, but did not cause a marked increase in fiber area in our study. Although our protocol was performed in the same manner as Nielsen et al. (2012) we could not observe a marked increase in muscle fiber area. A rest period of ten days could be sufficient to reset the activation of p70S6K, whereas p38MAPKγ might have changed sensitivity.

References: 1Nielsen JL et al. J Physiol 590: 4351-4361, 2012.

Poster session P2 ID-67

Neuromuscular adaptations during endurance training only vs. same-session combined endurance and strength training in recreational endurance runners

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Strength training-induced increases in neuromuscular performance have previously been associated with improved endurance performance in endurance runners. Typically, these findings origin from studies in which endurance (E) and strength training (S) were performed on separate days. However, it is yet to be investigated whether these benefits persist during same-session combined training, when S is repeatedly preceded by E and, thus, affected by residual fatigue. We investigated the effects of E (n=14) vs. E repeatedly preceding S (E+S, n=13) on neuromuscular function and endurance performance in recreationally endurance trained males. E was identical in the two groups and consisted of steady-state and interval running, 4-6 x wk-1 for 24 weeks. E+S performed mixed maximal and explosive S (2 x week-1) always right after a standardized E session. Time to exhaustion (Tmax) and velocity at 4 mmol·l-1 blood lactate (V4) during incremental treadmill running, 1RM (dynamic leg press), MVC (isometric leg press) and EMG of vastus lateralis/medialis during MVC were determined. Vastus lateralis CSA was measured by ultrasound. Both groups significantly increased Tmax and V4 (6-10%, p=0.022 to <0.001, btw-groups p>0.05). 1RM and MVC remained unaltered in E+S but decreased in E (-4±5, p=0.014 and -5±5%, p=0.003; 1RM btw-groups p=0.011). CSA decreased in E (-6±5%, p=0.001) and increased in E+S (7±7%, p=0.012; btw-groups p<0.001). EMG remained statistically unaltered in both groups. The main finding was that no changes in EMG were observed in either group but MVC, 1RM and CSA decreased in E, while in E+S strength was maintained and CSA increased. This possibly contributed to the finding that both groups improved maximal and sub-maximal running performance only to a similar extent. Whether same-session combined training with the opposite loading order leads to similar endurance performance benefits as previously observed during combined training performed on separate days needs further investigation.

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Poster session P2 ID-68

Heavy conventional strength training vs kettlebell training: A comparison of the effects on performance and body composition

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Strength training is used extensively among athletes with the aim of improving performance primarily via maximum strength and power gains, changes in body composition as well as prevention/rehabilitation. Various modalities are used and kettlebells represent a relatively new method with limited scientific evidence. 16 moderately trained males (>6 months experience with resistance training) (age 31±3 years, height 188±5cm, body mass 90±14 kg, mean±SD) underwent a trial consisting of familiarization, pretesting, an 8 week training intervention and post-testing. Subjects were randomly assigned to either conventional heavy-load strength training (STR) or kettlebell training (KB). Prior to and following the intervention, strength tests were conducted in the deadlift 1RM (DL) and kettlebell swing tests (KBST). Changes in body composition were assessed via DEXA scanning enabling measures of fat free mass (FFM), fat mass (FM) and total body Fat % (FAT%). Performance tests consisted of an agility test (AT) and counter movement jump (CMJ).
Following the intervention, both DL and KBST strength increased in the STR group with 17.5 ± 11.3% ($P \leq 0.001$) and 13.9 ± 18.0% ($P=0.028$) respectively with a significant intergroup difference for DL POST training ($P=0.046$). The KB group only improved KBST performance 22.5 ± 14.0% ($P<0.001$). Both groups increased FFM, STR 1.86 ± 0.91kg ($P<0.001$) and KB 1.02 ± 1.28kg ($P=0.017$) but FAT% 2.23 ± 2.34% ($P=0.011$) and FM 2.05 ± 2.28kg ($P=0.031$) only decreased in the KB group. There was no increase in CMJ height however a tendency was observed following KB training ($P=0.053$). 2nd split time decreased ($P=0.003$) in AT following KB training.
The results show that heavy conventional and kettlebell strength training are accompanied by specific effects on strength parameters and body composition. For both types of strength training there is minimal direct transfer to performance parameters. These results support the theory of training specificity.

Poster session P2 ID-69

Effects of time-of-day-specific combined strength and endurance training on physical performance, muscle hypertrophy and serum hormone concentrations in men

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The present study examined adaptations in physical performance, muscle hypertrophy and diurnal patterns of serum testosterone (T) and cortisol (C) after 12 weeks of time-of-day-specific same-session combined strength (S) and endurance (E) training. The intervention group (n=56) trained twice per week using either E+S or S+E order (2xS+E or 2xE+S) in the morning (m) or evening (e) for 12 weeks (mE+S n=13; mS+E n=14; eE+S n=14; eS+E n=15). Controls (n=11) participated only in the measurements. Time-of-day-specific (morning and evening) leg press 1RM and time-to-exhaustion during cycling (Timeexh), cross-sectional area of vastus lateralis (CSA of VL), T and C (at 7:00, 9:00, 12:00, 16:00, 18:00) were measured before and after the intervention. Increased 1RM was observed in all training groups in the morning (13-14%, $p<0.001$) and evening (14-18%, $p<0.001$). Evening 1RM increases were larger in eS+E, eE+S and mE+S compared to controls ($p<0.05$). The combined evening group (eS+E and eE+S) increased 1RM more in the evening than in the morning (17% vs. 13%, $p<0.01$). All training groups improved Timeexh in the morning (11-16%, $p<0.001$) and evening (10-14%, $p<0.001$). In the evening all training groups improved Timeexh more than controls ($p<0.05$). The increases in CSA in the training groups ($p<0.001$) were larger compared to that of controls ($p<0.01$). In all groups C and T demonstrated normal diurnal rhythm with no changes in morning basal levels. However, the mS+E group showed reduced afternoon T levels (at 16:00, $p<0.05$). The present 12-week combined strength and endurance training led to increased physical performance and CSA independent of training time and order. However, in the combined evening group larger strength gains were observed on their training-specific-time. Morning S+E training may lead to decreased evening T levels with no significant differences between morning and evening performance gains after 12 weeks of training in previously untrained men.

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Poster session P2 ID-70

Adaptations in maximal strength and muscle cross-sectional area following same-session and different day combined strength and endurance training in males and females

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Strength and endurance can be trained concurrently either when combined into the same training session with different orders or trained separately on different days. The present study aimed to investigate whether adaptations in maximal strength, endurance performance and hypertrophy differ between these three training modes. Previously untrained males and females (n=102) were divided into same-session combined training with endurance preceding strength (E+S, males n=16; females n=15), vice versa (S+E, males n=18; females n=14) or strength and endurance performed on different days (DD, males n=21; females n=18). Subjects adhered to the same training program. E+S and S+E subjects performed 2-3 combined sessions and DD performed 4-6 single sessions weekly for 24 weeks. Maximal dynamic leg press 1 RM, vastus lateralis cross-sectional area (CSA) and maximal workload during cycling (Wmax) were measured. At week 12 the increase in 1 RM was 17±7% ($p<0.001$) in the female DD group, while the increase in E+S was 7±9% ($p<0.01$) and in S+E 8±9% ($p<0.05$). At week 24 1 RM gains were significant ($p<0.001$) in all groups (males DD 13±7%, E+S 12±9%, S+E 17±12%; females DD 22±8%, E+S 13±12%, S+E 17±10%). All groups significantly increased CSA (males $p<0.001$: DD 12±6%, E+S 13±6%, S+E 12±6%; females DD 16±9% $p<0.001$, E+S 10±6% $p<0.01$, S+E 9±8%, $p<0.05$) and Wmax ($p<0.001$: males DD 21±11%, E+S 13±9%, S+E 16±7%; females $p<0.001$: DD 21±14%, E+S 21±10%, S+E 16±12%). Although not statistically significant, the magnitude of strength gains in females was larger in DD during the first 12 weeks in comparison to the same-session combined training modes, and relatively large individual responsiveness to the training modes was observed. Nevertheless, previously untrained males and females can obtain significant gains in 1 RM, muscle CSA and endurance performance independent of the present three combined training modes over a prolonged 24-week training period.

Poster session P2 ID-71

Effects of 24 sessions of resistance exercise on muscle power of the lower limbs in elderly patients with coronary artery disease participants of a cardiac rehabilitation program.

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It is established that strength and muscle power (MP) have a direct relationship with functional capacity in elderly people. The purpose of this study is to verify absolute and relative gains in MP of lower limbs in elderly people with coronary artery disease. Ten untrained subjects (72 ± 6.51y, 76.8 ± 4.8kg, 171 ± 9.48cm) were assessed on MP by FITRODYNE (Bratislava, Slovakia) equipment in half squat exercise (body weight) pre, post 12 and post 24 strength training sessions (STS). The STS was composed by 2 sets, 6-8 repetitions, 1 minute rest interval between sets and exercises, and the Borg CR-10 Scale was used to determine the training load (5-8) with emphasis on local fatigue. The STS exercise order in 12 weeks was: half squat, step up and plantar flexion. After 12 weeks leg extension, leg curl, seated hip adduction and seated hip abduction were added to STS. The results are showed no significant increase in absolute and relative MP after 12 STS regarding the pre: 354.70 ± 21.7 vs. 398.80 ± 29.27W (p 0.144) and 4.68 ±0.29 vs. 5.23 ±0.33 W/kg (p 0.157). After 24 STS the results showed a significant increase in absolute and relative MP the precondition: 354.70 ±21.7 vs. 447.90 ±31.78W (p 0.01) and 4.68 ±0.29 vs. 5.92 ± 0.29W/kg (p 0.007), as well 12 STS: 398.80 ± 29.27 vs. 447.90 ± 31.78W (p 0.038) and 5.23 ±0.33 vs. 5.92 ±0.29 W /kg (p 0.032) respectively. The relationship between significant increase on MP and the exercises added in the study should be considered. In elderly people 12 STS was not enough to increase absolute and relative MP. The significant increase was showed only with 24 STS.
Seguin R, Nelson ME. Am J Prevent Med. 2003; 25(3 Suppl 2): 141-9.
Vianna LC, Oliveira, Araújo CG. J StrengthCond Res. 2007; 21(4): 1310-4.

Katzmarazyk PT, Craig CL. MedSciSports Exerc. 2002; 34(5): 740-4.

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Poster session P2 ID-72

Effects of different whey protein products on hypertrophy signaling after a bout of resistance exercise.

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Milk protein seems to have a greater anabolic effect on skeletal muscle than soy protein. Differences also exist between the two milk protein fractions casein and whey, with a more rapid anabolic response after ingestion of the latter1. However, whey protein can be produced by different techniques and it is not known whether the processing of whey protein affects the biological response. Thus, our objective was to investigate the effect of ingesting whey protein produced by a filtration technique; native whey, as compared to the most common whey protein product; WPC-80, after a bout of heavy resistance exercise. The two whey products were also compared with regular milk (control). Twenty-two young men (n=13) and women (n=9) completed a bout of bilateral leg press and knee extension, followed by consumption of native whey, WPC-80 or regular milk. Muscle biopsies from m. vastus lateralis were analyzed by western blotting, to measure the phosphorylation status of p70S6K, eEF2 and p38 MAPK. Blood samples were collected to measure systemic amino acid concentrations. Ingestion of native whey resulted in higher plasma leucine concentration than WPC-80, and both whey products resulted in higher plasma leucine concentration than regular milk. There was a tendency towards a greater phosphorylation of p70S6K after the consumption of native whey, compared to milk, while no changes were observed in the phosphorylation status of eEF2, regardless of protein supplement. In general, phosphorylation of p38γ tended to increase, while the phosphorylation of p38α tended to decrease, with minimal differences between products. Although ingestion of native whey resulted in higher leucine blood concentrations than WPC-80, no differences in hypertrophic signaling was observed. Further analysis will reveal whether other differences in biological responses may exist between these whey products.

1. Tang JE, Moore DR, Kujbida GW, Tarnopolsky MA, Phillips SM. J Appl Physiol 107:987–992, 2009.

Poster session P2 ID-73

Relationship between static and dynamic maximal muscle force and start performance in sub-elite swimmers.

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The aim of this study was to investigate impact of absolute and relative maximal muscle force on start performance in sub-elite swimmers. Twenty five sub-elite swimmers (Mean±SD; age: 20.6±3.6 yr, body mass: 76.52±7.84 kg, body height: 182.20±7.15 cm) participated in this study. All participants performed swimming start trial corresponding to 10 m distance and standing leg extensors muscle force testing in isometric and isotonic conditions. For every participant the following variables were calculated for isometric and isotonic muscle force: leg extensor maximum voluntary force and leg extensor relative muscle voluntary force. Regression analysis showed that muscle force in isometric condition statistically significant predict time on 10 m swim trial where leg extensor maximum voluntary force (R2 adjusted = 0.265, $p<0.05$) is better predictor than leg extensor relative muscle voluntary force (R2 adjusted = 0.231, $p<0.05$). Contrary to isometric contraction, in isotonic condition muscle force did not significantly predict time on 10 m trial in sub-elite swimmer ($p>0.05$). To conclude, results from this study showed that sub-elite swimmers who have greater isometric muscle force (absolute and relative values) are able to improve starting performance especially in the first ten meter swimming.

Key words: swimming, muscle force, isometric contraction, start ability.

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Poster session P2 ID-74

Relationship between growth of physique and development of agility in junior badminton players: a longitudinal study.

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It is widely recognized that agility is importance for many sports. Therefore, in order to determine development of agility, many studies have been made in view of a relevance of growth physique. It has been studied for relevance to growth of physique and development of agility by cross-sectional study, but has not been studied very little by a longitudinal study. Thus, a purpose of this study was to investigate that relationship between growth of physique and development of agility in junior athletes in boys in a longitudinal study. Four male badminton players participated in this study. The players' ages at start of the study ranged from 8.9 to 12.1 years, with a mean age of 10.4 ± 1.3 years. Longitudinal changes were studied over a 3 year period. Twice a year, they performed 2 physique measures and 1 agility test. Measuring items of physique were body height and sitting height. Leg length was calculated from body height and sitting height. Proagility test (5 m-10 m-5 m) was used for agility. Velocity curve for physique and proagility test were described using polynomial and relationship of velocity curve between physique and proagility test were analyzed by cross-correlation function. Result of cross-correlation function, weak positive cross-correlation coefficient was recognized between leg length and proagility test (Rxv = 0.380 ± 0.614). On the other hand, there was moderate negative cross-correlation coefficient between sitting height and proagility test (Rxv = -0.519 ± 0.283). There was no relationship between body height and proagility test (Rxv = -0.210 ± 0.428). Based on these findings, it was suggested that growth of leg length might have a weak positive influence for development of agility in junior athletes..

Poster session P2 ID-75

Lower body strength & power adaptations over a professional rugby union season

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The purpose of this investigation was to assess the magnitude of effects of strength training on markers of strength and power performance over a professional rugby union season. Eight elite developmental level players were recruited for the investigation (age, 19.6±0.74, weight, 95.63±0.92, games played during investigation 25.8±3.39) based on strength training experience exceeding 2 years and being absent from less than 4 consecutive training weeks over a 48 week cycle. Maximum strength was assessed (isometric mid thigh pull) as well as lower body maximal power (CMJ) at three time points throughout the typical professional rugby union season (Pre, the first week of the season; mid, the end of the pre season preparatory period, end, the last week of the rugby season following competitive games). All assessments were carried out on a Kistler Force plate sampling at 1000Hz. Resulting from the time period pre to mid, trivial effects were found in all CMJ variables (jump height [JH], peak power [PP], relative power [RelP] and peak velocity [PV]), small to moderate negative effects were found for IMTP variables (peak force [PF], net force, [NF] and relative force [RelF]. Mid to end effects for CMJ variables PP, RelP were trivial; PV, JH effects were small. Mid to end effects for IMTP variables PF (d=1.44, 95% CI [350.5, 1489.0], p=0.01) NF (d=1.61, 95% CI [338.6, 1489.0], p=0.01), RelF (d=1.84, 95% CI [3.45, 14.6], p=0.01) were large. Significant season effects found in IMTP variables demonstrate the effectiveness of the strength-training program to develop strength in elite rugby union players. However the magnitude of change in CMJ variables were small and not significant. These findings may challenge the sensitivity of the CMJ variables measured in this investigation to strength training adaptations.

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Poster session P2 ID-76

Instability resistance training effects on muscular power outputs, resting metabolic rate and mood state in inexperienced resistance trainers

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The present study was designed to investigate the differences in muscular outputs, resting metabolic rate and mood state after eight weeks of stable and unstable resistance training in inexperienced resistance trainers. The sample consisted of 75 male subjects (aged 19–22), divided into three equal groups. The first experimental group consisted of participants who in addition to their usual daily physical activities (DPA) were involved in programmed resistance training under unstable conditions. The second experimental group consisted of participants who in addition to their usual DPA were involved in resistance training under stable conditions. The control group consisted of participants who only took part in their usual DPA without any form of resistance training. The research included bench press and squat exercises, performed with a barbell, with a previously established load of 50% of one repetition maximum (1RM). The unstable conditions were provided by a Swiss ball for the bench press, while barbell squats were performed on a BOSU ball. Five muscular outputs were evaluated: force, power, velocity, distance of movement of the barbell and 1RM. All muscular outputs improved with training. The multivariate analysis of variance showed that the differences in the applied training model as an experimental factor, leading to significantly higher values of muscular outputs in the unstable resistance training group. However, the values of resting metabolic rate and mood state did not show significant differences after different training models were applied. It appears that resistance training under unstable conditions is a more efficacious tool for increasing values of muscular outputs in relation to resistance training under stable conditions. However, training with 50% of 1RM under unstable conditions cannot be recommended as an effective method for increasing maximum muscle force for inexperienced resistance trainers.

Poster session P2 ID-77

Influence of intra-hospital exercise program in oldest old in functional capacity and ADLs

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The negative effect of hospitalization on functional outcomes in oldest old people and in-hospital cohort studies is well established. This impairment occurs even with short hospital stays. Loss of strength with bed rest can be 5% per day or more [1]. This study is an ongoing intra-hospital randomized control trial. Patients aged 75 years or older admitted for a short hospital stays are randomly assigned to a control (CG) or intervention group (IG). Participants in the CG receive normal hospital care, and the IG performs 2-3 sessions per day of lower limb strength training and walking while hospitalized. The primary outcome is functional capacity (FC) at admission and upon discharge, assessed with the Short Physical Performance Battery. The secondary outcomes are assessed pre-hospitalization and 3 months after discharge and include: Katz ADL score, mortality and number of falls since discharge. The IG (n=99, mean age 88y) had more fragility (63.3%) and falls (37.8%) than the CG (n=83, mean age 88y) at hospital admission, yet the former showed a significant increase in FC at discharge that was not observed in the CG. The ability to perform ADLs (at the same level as before hospitalization) was regained at discharge in 51.5% of the participants in the IG (vs. 36.1% in the CG; $p<0.05$). An intra-hospital program that include strength and walk exercise could contribute to regain faster the ability to perform ADLs in oldest old and frail people after hospitalization. These programs should be implemented to maintain independence [2] in this population segment.

1. Zisberg A et al. Low mobility during hospitalization and functional decline in older adults. J Am Geriatr Soc 2011, 59(2):266–273.
2. Ostir GV et al. Mobility activity and its value as a prognostic indicator of survival in hospitalized older adults. J Am Geriatr Soc. 2013; 61: 551-7..

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Poster session P2 ID-78

Association between hip extensors' strength and metabolic energy cost of walking in older adults

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Gait speed is associated with metabolic energy cost of walking (MECW) in older adults (1) and MECW is partly determined by neuromuscular factors (2). Therefore, the objective of this study was to assess the relationship between lower-body strength and MECW in older adults. Forty-eight participants (70.7 +/- 5.4 years old; 28 Females) completed an isokinetic maximal strength test as well as a MECW assessment at 3 velocities (2.4, 4 and 5.6 km.h-1). Results revealed that, for all walking conditions, significant correlations ($p<0.05$) were observed between hip extensors' maximal strength and MECW. Moreover, at 4 km.h-1, ankle plantarflexors and hip flexors also correlated ($p<0.05$) with MECW whereas at 5.6 km.h-1, both ankle plantarflexors and maximal isometric knee extensors' strength correlated ($p<0.05$) with MECW. Afterwards, 3 different linear regression models (1 per walking condition) were computed with MECW as the dependant variable. Age was included in each model in a first block as an independent variable. For each model, a second block including dependant variables identified in the correlational analysis was added. Results revealed that hip extensors' maximal strength was the only significant variable in these models. Together, these results suggest that hip extensors are important determinants of the MECW at different walking velocities in this cohort of healthy older adults. Future studies should focus on strength training strategies to increase hip extensors' strength, which could decrease MECW and improve gait speed.

1. Schrack JA, Simonsick EM, Chaves PH, Ferrucci L. The role of energetic cost in the age-related slowing of gait speed. J Am Geriatr Soc. 2012 Oct;60(10):1811-6.
2. Malatesta D, Simar D, Dauvilliers Y, Candau R, Borrani F, Prefaut C, et al. Energy cost of walking and gait instability in healthy 65- and 80-yr-olds. J Appl Physiol. 2003 Dec;95(6):2248-56..

Poster session P2 ID-79

Low muscle strength level and imbalance between trunk extensors and flexors still one year after lumbar spine fusion

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Lumbar spine fusion (LSF) may lead to muscle atrophy associated with severe trunk muscle atrophy and weakness. The aim of the present study was to analyze trunk muscle function preoperatively and 1-year postoperatively in patients undergoing LSF.
A total of 195 [mean (SD) age 61 (12) years, body weight 78(15) kg, median (IQR) duration of back pain 31 (18, 66) months] patients undergoing LSF participated in the study. The flexion and extension strength of the trunk was measured using a strain-gauge dynamometer and pain was assessed by visual analog scale (0-100 mm).
Preoperative trunk extension and flexion strength levels were 205(144)N and 295(172)N, respectively. One year postoperatively, the mean (95% CI) trunk extension strength had increased by 53(37 to 70) ($p<0.001$) and flexion by 69 (53 to 85) N ($p<0.001$). Preoperative extension/flexion strength ratio was 0.75(0.38) and did not change during the follow-up. Extension strength/body weight ratio was 0.34(0.18) and flexion /body weight 0.47(0.18) 1-year postoperatively.
Pain intensity during trunk extension was 55(29)mm and 14(25)mm and during flexion 41(29) and 11(21)mm preoperatively and 1-year postoperatively. There was a moderate correlation between preoperative trunk muscle strength levels and their changes during the 12-month follow-up [extension r= -0.42 (95%CI -0.55 to -0.29) and flexion r=-0.41 (-0.54 to -0.28)]. Although some increases occurred in strength during 1-year postoperative follow-up, there is a need for proper progressive strength training protocols to normalize back function and thus prevent further back pain episodes in LSF patients. The present results showed that trunk extension and flexion strength levels remained low still one year postoperatively, since the ratio in healthy subjects for strength/weight should be 0.80-1.00 for extensors and 0.65-0.80 for flexors. Moreover, the trunk extension/ flexion strength ratio is reported to be between 1.1-1.3 in healthy population, while it was considerably lower in the present LSF-patients.

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Poster session P2 ID-80

Effectiveness of a 12-month intensive strength training program on shoulder muscle strength after a rotator cuff repair: A randomized controlled trial

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The aim of the present study was to find out whether progressive shoulder strength training program is more effective compared to usual care on muscle strength after a rotator cuff repair.
A total of 66 [56% males, mean (SD) age 54 (6) years] working-age patients undergoing rotator cuff repair were randomized into an exercise group (EG) or a usual care group (UCG) 2 months postoperatively. The EG were given instructions on a shoulder muscle strengthening program to be undertaken at home, while the UCG received ordinary postoperative instructions. Isometric shoulder muscle strength was measured at the beginning of the intervention, and 12 months thereafter.
At 12 months, both groups improved significantly in muscle strength variables of the operated shoulder ($p<0.001$), and no significant differences between the groups were found. At 12 months, the mean (SD) shoulder internal rotation strength increased from the baseline 12.2 (5.2) kg by 21% in the EG, and in the UCG from the baseline 13.3 (5.7) kg by 16%. Shoulder external rotation strength increased from 6.9 (2.2) kg by 31%, and from 6.8 (2.7) kg by 32%, and shoulder flexion strength from 4.8 (2.2) kg by 35%, and from 4.4 (1.7) kg by 38%, respectively. In the EG, 57% of the patients completed the exercises twice weekly for the first six months, after which the training adherence declined to 23%. There was no correlation between training adherence and changes of muscle strength.
Both the home-based strength training program and usual care were effective in improving shoulder muscle strength after a rotator cuff repair. The training program was feasible but the adherence was low. Supervised rehabilitation with more progressive exercise program should be studied in the future.

Poster session P2 ID-81

Seasonal variations of physiological parameters in competitive judo athletes

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Unlike many team sports which are seasonal, judo competitions are a year-round affair. The aim of our study was to determine the changes in selected physiological parameters during one competitive season. In total, eight experienced judo athletes completed the same investigation protocol at four different moments during one year (during the main preparatory period, before the national individual championships, during main international tournaments, and before national team championships). The investigation protocol consisted of body composition assessments, the monitoring of muscular outputs during bench press and barbell squats, measurements of oxygen uptake during arm-crank ergometry and determinates of lactate thresholds. It was conducted in the same order all four times and with the use of the same equipment. Five muscular outputs were evaluated: force, power, velocity, distance of movement of the barbell and 1RM. A repeated measures analysis of variance determined that mean body weight and percentage of fatty tissue differed significantly between four different time points during one year. There was no statistically significant difference in oxygen uptake at the aerobic threshold and oxygen uptake during the maximal lactate steady state. However, a significant difference was observed in the maximal oxygen uptake between four different time points. All of the muscular outputs showed a significant difference between different testing periods. In conclusion, after a short pre-season, judo athletes improved their muscular outputs and maximal oxygen uptake while the other parameters showed only mild fluctuations. Understanding and monitoring these parameters enables the preparation and correction of individual areas of the training workload in appropriate cycles during a prolonged competitive season.

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Poster session P2 ID-82

The Effects of Carbohydrate Intake on Alactic and Lactic Power in 48 Hours after Intense Physical Activity in Athletes and Trained Adults

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Muscle power is associated with metabolic changes in the muscle. The anaerobic energy system is divided into alactic and lactic components, referring to the processes involved in the splitting of the stored phosphagens, ATP and phosphocreatine (PCr). In relation to this, there are the two important components of performance, alactic (AP) and lactic power (LP) parameters. The purpose of this study is to investigate the effects of CHO intake on AP and LP outputs in 48 h and to understand if CHO intake has any positive effects on AP and LP, after intense physical activities. The body composition and maximal aerobic power were determined for all of 24 adults (12 trained adults, 12 athletes). The participants ran at % 70 of their HRreserve for 1 h. The AP and LP were measured before and 30 min, 24 h, 48 h after the running. The same protocol was also performed with CHO intake (1 gr per body weight) right after the running. According to the results; the protocol without CHO intake didn't show significantly effect in both groups at any time period. For CHO intake protocol in trained group, there was no difference found on AP and LP at any time. The CHO intake protocol in athletes showed significantly higher AP results in 30 min than others and significantly higher LP results in 24 h than 48 h. Two groups' comparison for without CHO intake protocol showed that the athletes have significantly higher LP results in all time periods and higher AP results in 30 min, 24 h, 48 h. For CHO intake protocol, the athletes also showed higher results than trained group both on AP and LP. The conclusion of the study is that the CHO intake has no effects on AP and LP in trained adults. The higher results of AP and LP depend on being physically active. There is still more researches required to evaluate some differences in athletes depending on CHO intake.

Poster session P2 ID-83

Different range of motion amplitudes did not affect muscle cross sectional area, force and pennation angle, when time under tension was equalized.

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Previous studies (Bloomquist et al., 2013) have shown that different range of motion (ROM) training, might influence adaptations on muscle size, force and fascicle geometry. However, training volume was not equalized between different ROM groups. Therefore, the purpose of the present study was to investigate the effects of different ROM when the time under tension (TUT) was equalized. Nineteen subjects were randomly distributed on a control (CG) or training (TG) group. In the TG one of the subject's leg was randomly chosen to be trained with a full ROM (FULL) and the other with partial ROM (PAR). The subjects were trained 3 times per week during 15 weeks in isokinetic concentric knee extension exercise, with either a FULL (100o of knee flexion to 0o) or PAR (60o of knee flexion to 0o) ROM. Pennation angle (PA) was measured with ultrasonography at 50% of total muscle length. VL cross sectional area (CSA) and regional CSA (25, 50, 75% of total muscle length) were obtained with MRI. Maximum torque was obtained isometrically at 75o of knee flexion. All variables increased significantly from baseline in both training groups ($p<0.05$). The changes were respectively for FULL and PAR, PA: 9.6 and 12.3%; CSA: 5.3 and 4.1%; CSA25: 3.0 and 2.9%; CSA50: 5.5 and 4.5%; CSA75: 6.9 and 6.7%; Torque: 27.9 and 33.3%. No significant differences were found between FULL and PAR conditions for any variable. The present findings suggests that when TUT is similar, VL CSA, PA and isometric torque adaptations are not affected by the manipulation of ROM's.

Bloomquist, E., K., Langberg, H., Karlsen, S., Madsgaard, S., Boesen, M., & Raastad, T. (2013). Effect of range of motion in heavy load squatting on muscle and tendon adaptations. Eur J Appl Physiol, 113(8), 2133–42.

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Poster session P2 ID-84

Strength training associated with blood flow restriction: effects of different training intensities and occlusion pressure levels

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Low-intensity strength training (20-50% 1RM) associated with blood flow restriction (STBFR) promotes marked increases in muscle mass and strength. Despite its efficacy, it may be possible that the manipulation of some variables, such as occlusion pressure level and exercise intensity, can enhance the neuromuscular adaptations. Thus, the present study aimed to verify the chronic adaptations to STBFR protocols with different occlusion pressure levels and exercise intensities in young adults. Fifty male subjects were divided into five groups: 1) 20% 1RM with occlusion pressure equivalent to 40% systolic pressure (TF20/40); 2) 20% 1RM with 80% occlusion pressure (TF20/80); 3) 40% 1RM with 40% occlusion pressure (TF40/40); 4) 40% 1RM with 80% occlusion pressure (TF40/80); and 5) 80% 1RM with no occlusion pressure (TF80). STBFR protocols were composed of 3 x 15 repetitions and the TF80 with 3 x 10 repetitions with 60s interval between sets. In order to reduce intra-subject variability, each subject was randomly allocated to two of the five training protocols, one for each leg. Magnetic resonance imaging for the quadriceps muscle cross-sectional area (CSAq) and unilateral maximum strength (1RM) for the knee extension exercise were assessed before and after 12 weeks of training. Data were analyzed with a mixed model procedure (random factor: subjects; fixed factors: groups and time) with a Tukey post-hoc when necessary. We found similar increases in CSAq among groups after the training period (TF20/40 = 4.9%, TF20/80 = 6.8%; TF40/40 = 8.4%; TF40/80 = 8.7%; TF80 = 14.2%). In the same way, there were no differences in knee extension 1RM improvements among groups (TF20/40 = 8.7%, TF20/80 = 13.1%; TF40/40 = 11.8%; TF40/80 = 12.7%; TF80 = 21.0%). In conclusion, our results demonstrated that neither muscle hypertrophy nor maximum strength were enhanced by changes in occlusion pressure level associated with low-intensity strength training.

Poster session P2 ID-87

Comparisons of upper body strength gains between men and women

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Although resistance training brings benefits to men and women, there are still some questions to be answered in respect to gender differences in response to resistance training. The aim of this study was to compare the elbow flexors strength gains in men and women after 10 weeks of resistance training. Forty four untrained college-aged men (22.63 ± 2.34 years) and forty seven untrained college-aged women (21.62 ± 2.96 years) participated in the study. The resistance training program was performed two days a week for 10 weeks and the participants performed the same resistance training protocol, including leg press, knee flexion, chest press and pull-downs. All exercises were performed with 3 sets of 8-12 repetitions until concentric failure. If necessary, loads were adjusted from set to set to maintain the designated number of repetitions. Before and after the training period peak torque (PT) of the elbow flexors was measured with an isokinetic dynamometer. PT values were higher in men in comparison with women in pre- (49.35 ± 10.18 vs. 25.09 ± 4.89) and post-tests (55.08 ± 9.95 vs. 28.04 ± 5.52) ($p<0.01$). However, the alterations in muscle strength were not different between genders (11.61 and 11.76% for men and women, respectively). Therefore, there were no significance differences in upper-body strength gains between college-aged men and women after 10 weeks of resistance training program. In summary, the present investigation shows that untrained college-aged men and women experience similar elbow flexor strength gains when performing the same resistance training protocol for 10 weeks. Adding this result to others similar investigations, we realize that even with the physiological and hormonal differences between genders, women have shown the same relative strength gains compared to men.

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Poster session P2 ID-88

The functional and biological efficacy of blood flow-restricted strength training in untrained women

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Blood flow-restricted strength training (BFR) offers an efficient low-load alternative to traditional heavy-load strength training (TRAD). Still, limited data exists on the relative efficacy of these training forms, including how they affect cellular signaling. Here, we show that twelve weeks of twice-a-week contralateral BFR and TRAD of knee extensors in nine previously untrained women result in similar adaptations of a multitude of parameters (age 22±1 years). On the functional and physiological level, the similarity was evident as comparable increases in 1RM knee extension performance, comparable increases in cross sectional area of m. quadriceps femoris, as well as comparable increases in serum levels of human growth hormone in response to single training sessions at both 0 weeks and 12 weeks. On the cell level, the similarity was evident as comparable shifts in muscle fiber composition in m. vastus lateralis, i.e. increased MyHC2A proportions and decreased MyHC2X proportions, and comparable gene expression responses of 29 genes involved in skeletal muscle plasticity, assessed as both rested-state responses to 12 weeks of training and as acute responses to singular sessions of training, performed at both 0 weeks and 12 weeks. In conclusion, BFR and TRAD of knee extensors were associated with comparable adaptations of functional, physiological and cell biological parameters in previously untrained women, supporting the notion that BFR can be an effective alternative for increasing muscle mass and strength, with obvious benefits for patient groups that have reduced tolerance towards mechanical loads.

Poster session P2 ID-89

Effects of using lightweight baseball in high school pitchers during one bout of 100-pitches practice on performance

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Lightweight baseball has received lots of attention for youth pitchers as a preventive and training alternative to reducing loading or injuries of upper limb and improving throwing velocity. However, the effects of repetitive lightweight baseball throwing in young pitchers is still unclear. Therefore, the purpose of this study was to determine if using lightweight baseballs in the high school pitchers during one bout of 100-pitches practice has superior effects on throwing velocity and accuracy, and rating of perceived exertion (RPE) for throwing hand. Eleven elite pitchers from high schools were enrolled. Pitchers randomly underwent 100-pitches practice with a lightweight ball (4.4 oz) and a regulation-weight ball (5 oz). During the pitching process, the throwing velocity and accuracy of each pitch were collected using radar gun and digital video camera, and data from every 10 consecutive pitches were averaged for comparison. Moreover, RPE was evaluated using Borg Scale at each 10 pitches to determine the fatigue level of their throwing hand. A two-way ANOVA (2 weights × 10 pitching periods) was used for statistical analysis. The results showed that regardless of using lightweight or a regulation-weight balls, the throwing velocity and accuracy did not significantly reduce ($p>.05$), but the RPE value gradually increased with the increase in the number of pitches ($p<.05$). Moreover, the throwing velocity was significantly greater in the lightweight group than that in the regulation-weight group ($p<.05$), and the throwing accuracy and the RPE value had no significance between the two groups ($p>.05$). Based on our findings, using lightweight baseball had a greater throwing velocity without alteration of throwing accuracy during one bout of 100-pitches practice in high school pitchers, but increased fatigue with the increase of pitches to the same extent as using a regulation-weight baseball.

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Poster session P2 ID-90

Resistance loading of the new aquatic muscle training device in various levels of water buoyancy

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A new aquatic muscle training device was developed in this study and it was based on some of physics principles including buoyancy, drag, pressure and fluid dynamics. Water which is nature and lower carbon emission was used to be mainly material to create the resistance loading for the new aquatic muscle training device; as well as wood and recyclable materials were used as its structure material. However, the resistance loading of the new device whether affected by water buoyancy is still unclear. The purpose of this study was to investigate the resistance loading of the new aquatic muscle training device in various levels of water buoyancy. The Biodex isokinetic dynamometer was used to drive the device work at different levels of water buoyancy. The levels of water buoyancy were divided into 0%, 20%, 40%, 60% and 80% of water inside the buoy. The working velocities of the device were set at 0 and 60°/s. Each level was repeated five times with ten repetitions each time. After analysis of one way ANOVA, the resistance loading were significantly decrease with the increase of water buoyancy level at both static or dynamic conditions ($p<.05$). The resistance loading were 16.64±0.0, 13.66±1.6, 10.28±1.7, 7.42±1.4, 4.36±1.9kg with increase buoyancy level (0, 20, 40, 60, 80%) on isometric condition. The resistance loadings were 33.08±0.22, 27.10±0.11, 22.36±0.13, 14.46±0.28, 8.68±0.06kg during concentric condition; as well as were 14.28±0.09, 11.72±0.17, 8.68±0.08, 6.46±0.04, 2.68±0.08kg during eccentric condition. The finding suggested that the resistance loading of new aquatic muscle training device not only change by the water buoyancy levels, but also by isometric, concentric or eccentric conditions. Because of lower resistance loading, the new aquatic muscle training device might be appropriate equipment for elderly.

Poster session P2 ID-91

Hip Abduction vs Thigh Muscles Strength and Their Relation to Muscular Activity during Farmer's Walk Exercise

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Strength ratio between hamstrings/quadriceps (H/Q) is associated with knee injuries as well as hip abductors (HAB) weakness. The aim of this study was to prove if HAB and thigh muscle strength ratio predict the muscle activation during complex exercise.
Twenty strength trained men (mean± SD, 31,5± 3,4 years) performed 5s maximal isometric effort for 75° of knee flexion, 75° of knee extension and 15° of hip abduction on dynamometer IsoMed 2000. After isometry they performed a Farmer's Walk exercise. This exercise is also an event during strongman competition. The carried load was progressively increased up to 75% of their body mass (75BM). During isometric tests and walking with external loads were collected the electromyography data from vastus medialis (VM), vastus lateralis (VL), biceps femoris (BF) and gluteus medius (Gmed) on both legs by Noraxon 1400A device.
Participants were divided into groups by their H/Q, HAB/H and HAB/Q strength ratio to find out if the strength ratio would predict the electromyography amplitude expressed as a percent of maximum voluntary isometric contraction (%MVIC). Selected groups were participants with H/Q≥ 0.5, HQ< 0.5, HAB/H≥ 1, HAB/H< 1, HAB/Q≥ 0.5 and HAB/Q< 0.5.
Significant differences in %MVIC were find by ANOVA in the HAB/H at load of 75BM. Gmed activity was significantly greater in group with HAB/H ≥ 1 (26± 21.1 %MVIC) in comparison with HAB/H< 1 (39± 18.7 %MVIC). Gmed activity was also significantly greater in group with HAB/Q≥ 0.5 (26± 10 %MVIC) in comparison with HAB/Q< 0.5 (42± 14 %MVIC). Individuals with HAB/H< 1 and HAB/Q< 0.5 have greater activation of Gmed during Farmer's Walk exercise. HAB strength ratios predict the muscle involvement, when increasing the loads. The Farmer's Walk is recommended as an exercise, which strengthen the Gmed especially for individuals with HAB/H< 1 and HAB/Q< 0.5.

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9TH INTERNATIONAL CONFERENCE ON STRENGTH TRAINING

Saturday, 25th

Poster Presentations ID 92 – ID 125

Chairs

Prof. **Antonio Paoli**, Prof. **Avery D. Faigenbaum** and Prof. **Marco Narici**

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Poster session P3 ID-92

Effects of high intensity training (HIT) to mountain bikers' performance and neuromuscular functions

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Effects of high intensity training (HIT) to human performance have been widely investigated but less is known how it affects the neuromuscular system. The aim of this study was to examine whether HIT can improve neuromuscular performance and capability to resist fatigue in mountain bikers. 11 active mountain bikers were assigned to training (N=5) and control groups (N=6). Training group performed HIT for two weeks 6 times 4-6 x 30 sec "all-out" exercises with 4 min active recovery by using mountain biking to uphill. Maximal aerobic and anaerobic (Wingate test 30sec) performances were measured before and after the two week training session by using a cycling ergometer. Maximal isometric knee extension torque (MVC) and maximal EMG (aEMGmax) of rectus femoris (RF) and vastus lateralis (VL) muscles and maximal M-wave from RF-muscle and passive twitch were measured before and immediately after maximal exhaustive cycling ergometer test before and after the two week training session. No significant changes were observed in maximal aerobic test in either group but HIT induced a 7.4% ($p < 0.01$) increase in Wingate average power in training group, while no change was observed among the control group. Due to training pre-fatigue MVC changed from 333Nm to 360Nm in training group and from 333Nm to 300Nm in control group and post-fatigue MVC from 319Nm to 350Nm in training group and from 303Nm to 300Nm in control group (all changes n.s.). No significant changes were observed in aEMGmax, M-wave or passive twitch due to training or fatigue in either group. Results of this study suggest that already six HIT sessions can improve anaerobic performance but this may not be enough for neuromuscular improvements. Some positive trends on training effects and capability to resist fatigue, however, indicate that HIT can be recommended also from a neuromuscular point of view.

Poster session P3 ID-93

Hypertrophy- and atrophy-related signaling after ingestion of different milk protein fractions in combination with a bout of resistance exercise in elderly men and women.

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Protein quality is of importance for elderly, as they have been shown to display anabolic resistance. Whey protein is a potent stimulator of muscle protein synthesis, but whey can be produced by different techniques and it is not known whether the processing affects the biological response. The goal of this study was to test the effects of native whey (NW; produced by filtration) compared to regular whey protein (WPC-80; heated and chemically treated) in combination with resistance exercise on hypertrophy- and atrophy-related signaling pathways. Fifteen elderly (+70 yrs.) participants were randomized into two groups, receiving 20 g protein from either NW and WPC-80 on separate testing days or milk (control). Drinks were consumed 5 minutes and 2 hours after a bout of resistance exercise. Blood samples were analyzed for amino acids. Biopsies from m. vastus lateralis, obtained before, 1, 3 and 5 hours after exercise, were by western blotting analyzed for phosphorylation status of p70s6k and eEF-2, nuclear translocation of FOXO3a, nuclear and cytoskeletal translocation of MuRF-1, and ubiquitination of cytoskeletal proteins. Ingestion of native whey resulted in a higher plasma leucine concentration than WPC-80, and both were higher than milk. We found increased p70s6k phosphorylation after exercise, but no differences between groups. No changes were found for the phosphorylation of eEF-2. Greater translocation of FOXO3a to the nucleus was seen after NW and WPC-80 than milk. Reduced nuclear levels of MuRF-1 were seen after WPC-80 compared to milk. The ubiquitination of cytoskeletal proteins decreased in all groups, with no differences between groups. Despite a higher blood leucine concentration after ingesting native whey, no differences between groups were found for p70s6k, eEF-2 or ubiquitination. Only FOXO3a and MuRF-1 translocation were different between the whey drinks and milk. Further analysis will show whether this has implications for the muscle protein breakdown.

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Poster session P3 ID-95

Increases in strength and power during 20 weeks ofhypertrophic vs. periodized maximal strength-power training

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Producing explosive force and high velocity is important in several sports. Therefore, initial and peak power parameters are common markers to follow their development due to strength training. Usually, strength training targeted for improvement of maximum strength [MS] and power [P] includes heavy loads but a low number of repetitions or maximal contraction velocities with lower loads. Hypertrophic [Hyp] training consists of moderate intensities but a higher number of repetitions per set as compared to MS and P.

28 untrained men (28±6 years) were divided into two equal groups that trained either; 1) periodized 10-week MS followed by 10-week P 2) or 20-week Hyp training. Measurements were conducted before, after 10 and 20 weeks of training including; leg press 1RM (one repetition maximum) and explosive contraction with a load corresponding to 50% of 1RM. In addition, voluntary activation level [AL] was assessed by the twitch interpolation technique during isometric knee extensions. Muscle activity [EMG] parameters were measured during all contractions.

During explosive repetitions, initial power increased (11±15%, $p<0.05$) concomitantly with EMG amplitude (22±26%, $p<0.05$) only after P. This was also the case for peak power (15±18%, $p<0.05$) and EMG amplitude (93±105%, $p<0.05$) at larger knee-joint angles. These increases in peak power correlated with the corresponding changes in AL ($r=0.66$, $p<0.05$). The increases in EMG-amplitude over 100ms and 500ms were related to the changes in median frequency ($r=0.61$, $p=0.06$; $r=0.72$, $p<0.05$, respectively) again only after P. 1RM increased significantly only during the first 10 weeks (Hyp 8±6%, MS 11±6%) and EMG (25±30%) only during MS.

Power training provides naturally a specific stimulus to improve power production, which was accompanied by neural adaptation (i.e. changes in AL, EMG-amplitude and median frequency). However, maximal strength was not related to similar adaptation even though a slight increase in EMG was observed during MS training.

Poster session P3 ID-96

Cold water immersion reduces the acute satellite cell response to a standardized strength training session

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Cold water immersion (CWI) is a widely used recovery therapy following exercise to reduce signs and symptoms of delayed-onset muscle soreness and to speed up recovery. However, when applied as a regular recovery strategy after normal training, CWI has been reported to blunt adaptations to strength training[1]. Consequently, we hypothesized that CWI could reduce some of the acute hypertrophic responses to single exercise sessions. In this study we investigated the effects of CWI applied immediately after a strength training session on the acute satellite cell response.

Nine young men (22.1±2.2 years, 180±6 cm, 83.9±15.9 kg) performed two identical strength training sessions separated by at least 1 week. In a counter balanced order, legs were exposed to either CWI (10 min in 10°C) or control condition (CTR, 10 min low intensity cycling at room temperature) 5 minutes after exercise. Training consisted of 6 sets of leg press, 3 sets of single leg squat, 6 sets of knee extensions and 3 sets of walking lunges (8-12 reps in each set). Biopsies from m. vastus lateralis were obtained before, and 2, 24 and 48 hours after exercise. Satellite cells were identified on muscle cross sections with antibodies against both NCAM and PAX7.

The number of satellite cells increased significantly more in the CTR compared to the CWI condition when quantified with both the PAX7 (48±36% vs. 15±29%, 48 h) and the NCAM (23±19% vs. 5±9%, 24 h) antibody.

Cold water immersion attenuated the acute satellite cell response to a standardized strength training session. We will further investigate possible mechanisms behind this negative acute effect of CWI on muscle responses to exercise.

1. Roberts, L.A., et al., Cold water immersion reduces chronic training-induced adaptation. Med Sci Sports Exerc, 2014. 46(5): p. S192.

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Poster session P3 ID-98

Changes of maximum power by six-month strength training vs. Endurance training vs. Combination strength and endurance training on type 2 diabetics

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INTRODUCTION: The rapid increase of the incidence-rate of type 2 diabetes mellitus is a global problem (IDF, 2009). Physical exercise plays a central therapeutic role.METHODS: 110 type 2 diabetes patients have been randomised in 4 groups. The intervention groups absolved a supervised training (chip cards) for 1 hour twice a week. The first group (GR1) completed a strength-endurance circuit training twice a week, the second group (GR2) completed endurance training and the third group (GR 3) combined the half range of the circuit training (GR1) and the other 50% the endurance training of group 2. Group 4 (WKG) was waiting control group. Before, after 3 and after end of the six-month intervention plus follow-up time 12 and 36 months (retests are approved to 10 years follow-up) the following data have been measured amongst others: haemoglobin, oral glucose tolerance test, cholesterol, triglyceride, CRP, pulse-wave analysis, carotid analysis, parameters of urine, anthropometric variables, fat cover determined by means of bio impedance, ergospirometry, maximum strength, standardized evaluations of health, lifestyle and physical performance.RESULTS: 6months-drop-out rate was 19%. The power measurement (Dr. Wolff back-check), power data in relation to body weight) showed significant improvements of intervention group vs. WCG in trunk extension ($p=0.002$), trunk flexion ($p=0.014$), trunk lateral flexion left ($p=0.026$) and thoracic push ($p<0.001$). Moreover, there were significant improvements of GR1 vs. WCG in trunk extension ($p=0.004$) and thoracic push ($p=0.001$), GR2 vs. WCG in thoracic push ($p=0.004$), GR3 vs. WCG in trunk flexion ($p=0.042$) and thoracic push ($p=0.013$). There are no significances between the 3 intervention groups.
DISCUSSION: This study shows positive results for target physical exercise and research potential for appropriate measures by diabetics.
CONCLUSION: In summary, the patients benefited from the six-month training. There are no significant differences between the 3 intervention groups.

REFERENCES
[1] IDF, Diabetes Atlas 2009 – Prevalence, 1-3, 2009

Poster session P3 ID-99

Effects of two weeks of high-frequency low-load blood flow restricted resistance exercise (BFRRE) on leukocyte accumulation in exercised muscle

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Large increases in muscle fiber area have been reported after short term high frequency low-load BFRRE1. However, local stress responses2, as well as rabdomyolysis3, has also been reported in some cases after BFRRE. Consequently, it remains unclear whether high frequency BFRRE is safe and tolerable or whether it potentially could induce local inflammation and accumulation of leukocytes in stressed areas. Consequently, the purpose of this study was to investigate the muscular leukocyte response to high frequency BFRRE. Ten participants completed 14 BFRRE sessions divided into 2 blocks of 7 sessions in 5 days, separated by a 10-day rest period. Both legs completed 4 sets to voluntary failure with partial blood flow restriction (100 mmHg; men, 90 mmHg; women) using unilateral knee extensions at 20% of 1RM. Muscle biopsies were obtained from m. vastus lateralis repeatedly during and after the intervention and analyzed for macrophages and neutrophils (CD68+ and CD66b+ cells respectively). A tendency towards an increase in fiber area of both type I and II fibers (19% and 15% respectively) was observed 10 days after the last training session. Preliminary data indicate a gradual increase in number of CD68+ cells during both training blocks. The CD66+ cell data is in process and will be presented at the conference. Preliminary data indicate a gradual increase in leukocytes in the exercised muscle and this might suggest that the high frequency BFFRE protocol was too stressful for some of the participants. Furthermore, too stressful exercise was clearly manifested in one subject who had to withdraw from the intervention because of severe muscle pain after the initial three sessions.

1. Nielsen JL et al. J Physiol 590: 4351-4361, 2012.
2. Cumming et al. Acta Physiologica, Epub, 2014.
3. Iversen and Røstad, Clinical Journal of Sport Medicine: 20: 218–9, 2010.

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Poster session P3 ID-100

Relationship between force and sprint performance in young female swimmers

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Force production while swimming has been considered a crucial parameter to achieve better performances (1). According to Keskinen (2), tethered swimming allows to accurately evaluate force production performed by a swimmer in specific exercise conditions. Thus, the aim of this study was to analyze the association between force parameters and swimming velocity in young swimmers. Eighteen young female swimmers (13.6±0.70 years of age, 51.1±6.94 kg of body mass and 161.3±6.66 m of height) performed 50 m at maximum velocity, and also 30 s at maximal intensity in tethered swimming in front crawl to measure mean force - Fmean -, maximal force - Fmax - and index of fatigue - IF. Pearson correlation coefficients were determined to assess the relationship between velocity and Fmean, Fmax and IF. A mean velocity of 1.62±0.06 m·s-1, 148.6±74.5 N of Fmean, 157.2±73.6 N of Fmax and 11.8±5.3% of IF were registered during the tests. It was observed a medium positive correlation between velocity and force ($r=0.53$ for Fmean and $r=0.52$ for Fmax, both with $p<0.05$) and a non-significant negative correlation between velocity and IF ($r= -0.31$, $p>0.05$). These results highlighted the importance of strength training in young female swimmers to improve short distances performance. Data also revealed that IF is not associated with the velocity, probably because swimmers with different declines on the acquired force-time curves can present similar IF.

1. Barbosa, A.C., Castro, F.S., Dopsaj, M., Cunha, S.A., Júnior, O.A. (2013). Acute responses of biomechanical parameters to different sizes of hand paddles in front-crawl stroke. J Sports Sci 31: 1015–1023.
2. Keskinen, K.L. (1997). Evaluation of technique performances in freestyle swimming. Kinesiology. 2:30–38.

Poster session P3 ID-101

Can a program based on postural exercise associated with intermittent apneas improve physical fitness of young students?

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Physical fitness level is a marker of cardiovascular health in youth. Postural exercises associated with expiratory apnea, called Hypopressive Technique (HT) are widely used in Spain for rehabilitation and also for performance improvements. Nevertheless, there is little evidence of HT training for different populations. The aim of this study was to analyze the effects of an intervention program with HT on physical fitness of young students. 45 students (from 16 to 25 years) from several secondary school classes participated. They were randomly assigned to an experimental group (EG, n=29) that performed twice a week eight HT exercises during 7 weeks, and control group (CG, n=16). Were assessed at baseline and after the intervention: forced vital capacity (FVC) and forced respiratory volume (FRV) by spirometry; hamstring extensibility with sit & reach test; anthropometric data related to cardiovascular risk factors such as waist circumference and body mass index (BMI); aerobic capacity was measured by Course-Navette test and trunk strength by 30 second abdominal test. Significant differences were found for EG on extensibility, FVC, FRV, waist and aerobic capacity ($p<0.05$). The maximal oxygen consumption increased 7.811 mL/kg./min in the EG. However, no significant differences between groups were shown for BMI ($p= 0.326$) and abdominal strength ($p=0.827$). The results suggest that a seven-week program based on HT can improve some aspects such as aerobic capacity and forced vital capacity related with physical fitness of students. Further studies with different populations are needed to confirm these results.

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Poster session P3 ID-102

Immediate effects of postactivation potentiation protocol using blood flow restriction.

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Blood flow restriction (BFR) is a recent alternative for high intensity resistance training. Several mechanisms are hypothesized to explain the benefits in hypertrophy and strength gains. However there is a lack of data that relate BFR with acute power outcome or postactivation potentiation (PAP). The aim of this study was to explore the effect of BFR as a preparatory performance on jump performance. Twenty-one highly trained individuals were recruited (24.62 (4.5) years; 23.02 (2.19) BMI; 5.10 (3.12) years of experience in resistance training). After standardized warm-up the intervention consisted of 3 sets of 15 repetitions of ¼ squat on dominant leg superimposing a tourniquet at the most proximal portion of the thigh for achieving BFR (1/3 of systolic blood pressure). The jump height [16.34 (4.0) vs. 16.57 (35) centimeters], time in flight [0.36 (0.0) vs. 0.36 (0.0) seconds], power [634.94 (151.97) vs. 637.45 (142.17) watts] were assessed at baseline and after the intervention. T-Student test shows no significant difference ($p > .05$) for all the variables under observation. Our results suggest that BFR has no immediate effect on PAP and thus no effect on jump performance. Further studies are warranted to determine whether different protocols of BFR have immediate effects on PAP.

Poster session P3 ID-103

Can sex influence immediate pelvic floor muscle strenght of nulliparous women?

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Pelvic floor muscle (PFM) are responsible for the involuntary contractions during orgasm. PFM strength has been related to better sexual function and orgasm arousal. However, there is still little evidence on the effects of sex on the contractility of women`s PFM. This study aims to evaluate women PFM strength after immediate sexual intercourse. 41 women with no obstetric past and pelvic floor or sexual dysfunction were included in the study with a mean age of 32 years (SD=6.0) and body mass index 22 (SD=3.9). PFM strength was measured before (without menstruation) and one hour after sexual intercourse and orgasmic climax. Women underwent standardized clinical evaluation with pelvimetre® and Phenix USB2 software. Clitoral and vulvar temperature, blood pressure, heart rate and type of sexual intercourse (partner, masturbation or with dildo) were also recorded. Data analysis was based on Analyses of covariance. No significant differences were shown between PFM strength before and post-sex ($p<.05$) although only vulvar temperature increased postsex ($p=0.03$). In addition, the form of sex does not affect PFM strength ($p<.05$). Our findings suggest that inmediate sexual intercourse does not influence PFM strength. Further studies in women with perineal pathology may confirm these results.

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Poster session P3 ID-104

Protein degradation and cellular stress response after two weeks of high-frequency blood flow restriction resistance exercise

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High frequency blood flow restricted resistance exercise (BFRE) has been shown to induce rapid muscle growth (1). However, whether such intensive training blocks causes cellular stress and affects protein degradation systems is still largely unknown. Consequently, the aim of this study was to investigate ubiquitin-proteasome system markers, heat-shock protein (HSP) responses, and muscle growth during and after two blocks of high frequency BFRE interspersed by 10 days of rest.
Nine healthy subjects completed four sets (30 s rest) to voluntary failure with partial blood flow restriction (90-100 mmHg) using unilateral knee-extensions at 20 % of 1 repetition maximum (1RM). Biopsies were obtained from m. vastus lateralis. Muscle ring-finger protein-1 (Murf1), free ubiquitin (UbF), conjugated ubiquitin (UbC), HSP70, αB-Crystallin, and muscle fiber area (MFA) was assessed using immunohistochemistry and western blotting.
UbC levels were reduced during each training week, whereas Murf1 showed a delayed response and was reduced after the first week. UbF and HSP70 levels were increased after 3 sessions, but only HSP70 showed a restored response in the second block of BFRE. Soluble αB-Crystallin levels were reduced 1 hour after the first bout of each training week. Furthermore, immunohistochemical analysis showed higher staining intensity of bound αB-Crystallin in type 1 fibers 1 hour after the first bout, and the response was restored after a ten-day break. MFA increased in type 1, but not in type 2 fibers.
Two blocks of high frequency BFRE reduced ubiquitination of proteins and levels of the muscle specific ubiquitin ligase Murf1. BFRE seems to stress the muscle cell, causing an activation of HSP70 and possibly translocation of αB-Crystallin to cytoskeletal proteins. Interestingly, the stress response and hypertrophy were more pronounced in type 1 than type 2 fibers.

References: 1Nielsen JL et al. J Physiol 590: 4351-4361, 2012.

Poster session P3 ID-105

Muscle weakness thresholds to predict all-cause mortality: A meta-analysis.

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Increasingly compelling evidence has highlighted the importance of muscular strength capacity as a protective factor for health, across populations. Perhaps the quintessential example of this link is represented by the growing body of longitudinal research that demonstrates an association between muscle weakness and early, all-cause mortality. However, what remains to be established are sex-specific, clinically meaningful cutoffs for muscle weakness for prediction of mortality risk. Therefore, the purpose of this study was to determine the extent to which weakness, as defined by low thresholds of absolute grip strength across cohort studies, predicts mortality in males and females. Effect estimates were pooled by using random-effects meta-analyses to determine age-adjusted hazard ratios during a minimum follow-up of 5-years. From 38 cohort studies and 85,644 individuals (71.31±14.8 years), there were 28,406 deaths (~32%) over an average 12.2 years of follow-up. The pooled hazard ratio for weakness was 1.61 (95% CI 1.49 to 1.73) (Figure 1), and there was significant heterogeneity between studies ($I2=77.1\%$; $Q=161.3$, $p<0.001$; $\tau2=0.033$). Among males, the mean grip weakness threshold across studies was 28.3±8.2 kg, and was reflective of a pooled hazard ratio of 1.58 (95% CI 1.41 to 1.78). Among females, the mean grip weakness threshold was 17.0±2.5 kg, and was reflective of a pooled hazard ratio of 1.47 (95% CI 1.35-1.61). Meta-regression revealed that heterogeneity was partially explained by length of follow-up ($\beta= -0.013$ years; 95% CI -0.02 to -0.01; $p=0.002$). Low hand grip strength is a robust, independent predictor of all-cause mortality, and demonstrated an approximate 58% and 47% increased risk of death, for males and females respectively, over a 12-year follow-up. Weakness thresholds may therefore prove very useful in the clinical setting to screen for older adults at heightened risk for early death.

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Poster session P3 ID-107

Effects of a 4-week concentric and contrast strength training and detraining in swimmers: a pilot study.

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The aim of this study was to compare the effects of contrast and concentric method on strength and detraining of swimmers. 15 well-trained swimmers (27.0 (2.5) years; 23.10 (3.12) BMI) with more than 5 years of experience in swimming training were randomized to three equal groups: contrast group (CG1), concentric group (CG2) and control group (CG). The experimental groups (CG1 and CG2) trained seven strength exercises four days a week over a period of 4 weeks with the only difference of the strength method, contrast or concentric respectively, CG did no strength training during the intervention. 1RM strength, 50 and 100 meters speed test were assessed at baseline, inmediatly after intervention program and after week of detraining. The results showed that both experimental groups increased 1RM strength, however no significant differences were presented between them ($p>.05$). Only CG2 obtained significant differences respect CG and CG2 on 50 and 100 meters speed test ($p<.05$). Detraining data analysis showed no significant differences between the three groups ($p>.05$). These findings suggest that a 4-week contrast and concentric strength training methodology can increase maximal strength of swimmers but doesn`t present differences between both training methods and one-week of detraining.

Poster session P3 ID-108

Validity and correlation of selected strength and power tests in kindergarten children

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The aim of this study was to establish validity and correlation for the different strength and power tests for kindergarten children. This age group has shorter attention level, greater variability in motor skill tasks performance and difficulty in motivation to achieve maximal efforts. Due to this reasons there is lack of research on appropriate strength and power tests in this age group. The subjects of this study were 73 kindergarten children (32 boys and 41 girls) age 5-6 years old. They were tested in Standing Long Jump (SLJ), Sergent's High Jump (SHJ), four different medicine ball (1kg) throw tests (MB), sit-ups for 10 sec (SU10sec), squat jumps (SJ) and bench press (BP) with Fitrodyne dynamometer (Fitronic, Bratislava, Slovakia) attached to the wooden bar was used to measure the muscle power output and speed of the vertical motion during the movements. Interclass correlation coefficients (ICCs) were used to examine reliability, and Pearsons correlation coefficient were used to examine validity. The reliability estimates of the four different medicine ball throw tests were 0.83; 0.92; 0.94 & 0.98. Different jumps (SLJ & SHJ) showed test-retest reliability between 0.91 and 0.96. Day to day reliability for SU10sec was 0.93. Speed and power measured with Fitrodyne showed high reliability during the squat jump (0.92 & 0.93) while bench press showed week correlation, which could be explained with the difficulties in explaining this unfamiliar movement for very young children. Standing long jump showed high correlation with high jump, different medicine ball tests and sit-up test $p<0.01$; and high correlation with speed and power during squat jump movement $p<0.05$. There is small correlation between squat test and sit-ups test $r = 0.3$ ($p=0.06$). There are no statistically significant correlations between SJ and test and sit-ups test with medicine ball throw tests.

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Poster session P3 ID-109

Acute effects of multiple sets of exercises with flex bar on isometric and dynamic contractions

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The use of different kind of vibration training for improving muscle strength and power potentials has been investigated for many years. Exposure to vibrations may results in significant improvement in power output in post vibratory period and be used as an effective worm up protocol. In last decade a novel form of exercise using a flexible rubber bar (FlexBar) have been developed. The purpose of this study was to examine the effects of multiple sets of exercises with flex bar on muscle strength and power in isometric and dynamic conditions. The subjects of this study were 34 students (16 boys and 18 girls) age 20 ± 1.2 years. Warm-up program consisted of 5 series of 30sec flex-bar exercise with 1 minute rest between the series. Acute effects of warm-up with flex-bar were examined immediately after (IA) and 5 minute after (5minA) the worm up. Isometric strength evaluation was carried out by the isometric dynamometer and dynamic evaluation of muscle power was tested with Fitrodyne dynamometer attached to the bar in order to measure the muscle power output and speed of the movement. The results showed that Flex-bar warm-up had positive effects on maximal isometric muscle force (Fmax) immediately after ($p<0.01$) and 5 minute after ($p<0.01$) the last series. Flex-bar warm-up lead to decrease of maximal speed (Vmax) and the maximal power (Pmax) in the concentric faze of contraction immediately after last series of exercise. Maximal speed (Vmax) and the maximal power (Pmax) registered during concentric contraction 5 minutes after the warm-up showed statistically significant increase ($p<0.01$) compared to evaluation immediately after the warm up, and statistically significant increase ($p<0.05$) compared to the initial evaluation.

Poster session P3 ID-110

The Analysis of Muscle Force Development with Trained and Elite Athletes

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The goal of this review was to investigate whether maximal rate of force development (MRFD) research can provide excellent benchmarks for training. The review underlines the influence of the speed of activation, and the synchronization/optimization of motor units on MRFD. In addition, this review shows that MRFD represents an outstanding discrimination factor in athletes. The analysis focused on research involving force development in athletes who won gold medals in Olympic, world, European and national competitions as well as non-medal athletes. According to the analyses, MRFD for elite athletes was reached in time interval ranges from 0.063±0.007s to 0.115±0.016s, using 56% to 89% of maximal isometric force. These data suggests an emphasis on training to attain MRFD within time intervals of 0.130s. Analyses showed that MRFD developed within this duration represents an excellent discriminator ($P<0.01$) between elite athletes competing in different disciplines and also between elite athletes and well-trained individuals. To conclude, MRFD is related to ($P<0.01$) the conditions and regimes of muscle work, level of force developed by individual groups of motor units, speed of activation, synchronization and optimization of motor units at intramuscular and intermuscular levels.

Key words: motor units' activation speed, motor-unit optimization, maximal force in motor unit groups, model and discrimination value

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Poster session P3 ID-111

An Innovative Way to Measure Upper Body Strength

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The purpose of the present investigation was to examine the association of a novel test of upper body isometric strength against a 1RM bench press measurement. Forty college age adults (n=20 female, n= 20 male; mean ±SD; Age 22.8±2.8years; height 171.6±10.8cm; weight 73.5±16.4kg; body fat 23.2±5.4 %) volunteered for the present investigation. The participants reported to the lab on three occasions. The first visit included anthropometric measurements and familiarization with both the upper body isometric test along with 2 practice sets of bench press exercise where technique was evaluated. The final two visits were conducted in a randomized order, with one being a 1RM assessment on the bench press and the other consisting of three trials of the novel upper body isometric assessment. Grip width was held constant at 150% of biacromial width for both the bench press and isometric test. For the isometric test, participants were positioned in such a manner to create 90 degrees of elbow flexion, a flat back and 150% of biacromial width in a "push-up" style position while tethered (stainless steel chain) to a load cell (high frequency) anchored to the ground. The participants were instructed to push-up against the chain as hard as possible, and were not allowed to start with any slack in the chain. The peak isometric force was recorded for each of the three trials separated by 5 minutes of recovery. The peak result of the three trials was used for subsequent analysis. Multiple regression analysis was completed with the predictors: peak isometric force, gender, body weight against the outcome variable 1RM bench press. The analysis resulted in a significant model (r2=0.868, p≤0.001). Isometric peak strength had the greatest effect on the model (t=6.39,p≤0.001). Results from this study suggest that the novel isometric upper body strength assessment is likely to be a valid tool to determine strength. Further research is warranted to gather a larger pool of data in regard to this assessment. This study provides coaches with a quick and effective tool to collect strength data that is strongly associated with strength in the bench press movement. The equipment for this test is not cost prohibitive and practitioners could examine this as a time efficient alternative to conducting 1RM bench press assessments in large groups.

Poster session P3 ID-113

The influence of the stomatognatic apparatus in athletic performance: the effects of the palatal exteroceptors stimulation in football players

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Previous studies demonstrated that the hard palate is richly supplied with a variety of mechanoreceptors. The aim of this study was to examine the possible effects on explosive strength which might derive from the stimulation of the palatals exteroceptors through the voluntary press of the "spot-tongue". A number of sixty football players voluntarily participated to the study (Age: 24,3±7,2 yrs; Height: 174,3±8,6 cm; Weight 63,7±7,6 kg). Each participant was invited four times to perform the explosive strength test "Squat Jump test - SJ". After the first attempt for the familiarization, the SJ was administered in three different occlusal conditions: SJ with the tongue at the palatal spot (PS- SJ); SJ with the tongue at the palatal spot and the increase of the mandible's verticality (VPS-SJ); SJ with the tongue supported behind the teeth (BT-SJ). One day data collection was adopted with the different occlusal conditions administered randomly. A p value lower than 0.05 was considered to be statistically relevant. The performances of BT-SJ were generally lower than to performances both in PS-SJ and VPS-SJ. Significant differences were identified between BT-SJ vs VPS-SJ ($p < 0,0001$) and PS-SJ vs VPS-SJ ($p < 0,0001$). Interesting differences were found between PS- SJ vs BT- SJ without scientific significance. This study showed how the stimulation of the palatals exteroceptors and the lingual occlusion can influence the performance. The tongue supported behind the teeth represents a negative stimulus and by contrast, the tongue at the palatal spot, with and without the mandible's verticality, can give a positive stimulus improving the performances, in particular explosive strength. However, our results have to be confirmed and supported by other studies.

References
1. Halata Z, Baumann KI: Sensory nerve endings in the hard palate and papilla incisiva of the rhesus monkey. Anatomy and embryology 1999, 199:427-437.

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Poster session P3 ID-114

Effects of neuromuscular electrical stimulation and resistance training on knee extensors/flexor muscle performance

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Neuromuscular electrical stimulation (NMES) has recently drawn a lot of attention as means for strengthening of voluntary muscle contraction both in sport and rehabilitation. NMES training increases maximal voluntary contraction (MVC) force output through neural adaptations. On the other hand positive effects of resistance training (RT) on muscle strength are well known. The aim of this study was to investigate effects of a 5-week program of NMES compared to RT program of same duration. Sample of 15 students of Faculty of Sports and Physical Education (age 22 ± 2) were randomized in two groups: NMES (n=7) and RT (n=8). NMES group performed NMES superimposed over voluntary muscle contraction, RT group performed resistance training with submaximal loads. Subjects were evaluated for knee isokinetic dynamometry on both sides (60º and 180º s). After intervention no significant difference between groups were observed in isokinetic dynamometry (P=0.177). However, applying t test within each group revealed that peak torque increased in NMES group (P=0.002 for right knee extensor muscles, P=0.003 for left, respectively, at 60º and P=0.004 for left knee extensor muscles, at angular velocity 180º). In RT group (P=0.033 for right knee extensor muscles, P=0.029 for right knee flexor muscles, at angular velocity 60º). Our results indicate that NMES has equal potential for enhancement of knee muscles concentric peak torque as classical RT. Furthermore, the overload on locomotor apparatus during NMES is minimal and force of muscle contraction is equal on both sides.

Poster session P3 ID-115

Evaluation of knee joint proprioception and balance in young female volleyball players. A pilot study

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Aim: The aim of this study was to evaluate the effects of long-term volleyball practice on knee joint proprioception and balance in young female athletes.
Method: An observational case-control study was performed and 19 female volleyball player and 19 sedentary healthy counterparts were recruited as gold standard/control. The Biodex balance system and Biodex Dynamometers were used for the evaluations, respectively. A paired t-test was adopted in order to determined differences between performance of athletes and non-athletes.
Results: The knee proprioception analysis showed a significant difference at 60° join position in active (0.01) and passive (0.05) tests, respectively. Similar trend, but not significant, was found during the 20° joint position tests (>0.05). The postural stability tests showed similar results in both groups with no differences between them.
Conclusion: In Conclusion, the results indicates an interesting influence on keen joint proprioception provided by a long-term exposure to a team sport like volleyball. The postural stability indexes showed similar trends, highlighting comparable ontogenesis between groups.

References
1. Hrysomallis C: Balance ability and athletic performance. Sports medicine 2011, 41:221-232.
2. Arnold BL, Schmitz RJ: Examination of balance measures produced by the biodex stability system. Journal of athletic training 1998, 33:323-327.

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Poster session P3 ID-116

Whole body vibration (WBV) and type 2 DM

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Whole body Vibration (WBV) is a training methodology used both for the improvement of neuromuscular performance in healthy subjects (Rehn et al., 2007) and as an instrument of rehabilitation in persons exhibiting chronic illness at a neurological, muscoloskeletal or metabolic level (Chanou et al., 2012). Vibrations transmitted through the platform (tonic vibratory reflex) induce in the skeletal muscles a reflex activity capable of improving specific characteristics of the muscle itself (strength and flexibility). The aim of this study was to verify, with a sample of 21 subjects (12 M, 9 F) suffering from type 2 diabetes, that WBV can also increase the sensitivity to insulin at a muscular level and thereby improve the following parameters: Glycated Hemoglobin (HbA1c), Body Mass Index (BMI), Maximum Ozygen Consumption (VO2max) and Weight. Participants were involved in a specific activity program :3 sessions of 1 hour, each week for a total of 3 months. The procedure consists of an aerobic phase and 2 vibration sessions. Each vibration session (Vertical Vibration Platform) has 6 different static iterations with breaks between exercises: Squats, Lunges L/R, Biceps Curls, Triceps Dips, Push Ups and Abdominal Crunches. After 12 weeks of exercises (T1), the variables taken into consideration showed significant improvements. In conclusion, WBV is a valid training methodology for increasing strength and sensitivity to insulin in the muscle.

References
1) Rehn B., Lidstrom J., Skoglund J., Lindstrom B.(2007) Effects on leg muscular performance from whole-body vibration exercise: a systematic review. Scandinavian Journal of Medicine and Science in Sports 17, 2-11;
2) Chanou K., Gerodimos V., Karatrantou K., Jamurtas A. (2012). Whole Body Vibration and Rehabilitation of Chronic Diseases: A Review of the Literature. J Sports Sci Med. Jun 2012; 11(2): 187–200.

Poster session P3 ID-117

Upper body endurance pulling and pushing strength in sedentary individuals.

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Symmetrical strength between antagonist muscles has a fundamental role in order to prevent pathologies caused by bad postures or over training of specific muscle groups[1, 2]. Therefore, the aim of this study is to understand the ratio between pulling and pushing strength in sedentary individuals. 212 healthy subjects (Age 32±13.27 Years, Weight 70.2 ± 14.12 Kg, Height 173 ± 9 cm), of both genders (139 M, 73F) were retained for investigation. Pulling strength was assessed through a Lat machine while pushing strength through a Chest press. Both tests were performed to exhaustion with an overload of 30% of each subjects bodyweight. Pearsons correlations and differences through a t-test were analyzed. Subsequently the ratio for both genders of pulling and pushing strength have been assessed by means. A mean number of 57 reps was shown with the Lat machine while 34 with the Chest press. A correlation of 0.42 has been found between the number of repetitions of the two tests. A significant difference was found between such results ($p < 0.001$). The results indicate that sedentary subjects have higher pulling strength than pushing. The lat machine to chest press ratio was 1.36 in male while 2.69 for female. These preliminary values for sedentary individuals are opposite to those found in previous studies with recreationally active individuals and professional athletes [1, 3]. Resistance training should be performed in order to minimize such ratio.

References
1. Negrete, R.J., et al., Upper body push and pull strength ratio in recreationally active adults. Int J Sports Phys Ther, 2013. 8(2): p. 138-44.
2. Kolber, M.J., et al., Shoulder joint and muscle characteristics in the recreational weight training population. J Strength Cond Res, 2009. 23(1): p. 148-57.
3. Baker, D.G. and R.U. Newton, An analysis of the ratio and relationship between upper body pressing and pulling strength. J Strength Cond Res, 2004. 18(3): p. 594-8.

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Poster session P3 ID-118

Effect of 6-months military deployment in Afghanistan on anthropometrical, biochemical and performance parameters – preliminary results

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The guarding of military bases in Afghanistan, part of the Slovak Armed Forces mission within the International Security Assistance Force (ISAF), is characterized by 12- and 24-h, respectively, sedentary to light physical workload shifts. Together with ad libitum food intake and unregulated physical activity during the leisure time, the impact of a 6-month ISAF deployment on soldiers' conditioning, anthropometrical and biochemical parameters is unknown. Twenty five male deployed soldiers (ISAF) volunteered and were measured before and after the 6-month deployment. Another 25 homeland-based male soldiers served as a control group (Control). As to the results, total body fat percentage decreased significantly in ISAF (Pre 23.2±5.3 – Post 20.8±5.5 %) while no change was observed in Control (20.2±6.9 - 20.5±7.0 %). Changes in body fat significantly correlated with changes in body mass with a mean change of -1.9 kg in ISAF compared to +0.5 kg in Control. ISAF physical performance significantly improved when tested by 4x10 m shuttle run (10.86±0.90 - 10.49±0.63 sec) and pull-up test to failure (4.7±3.7 - 7.5±6.7 rep.) but not in Control for the respective tests (10.28±0.74 - 10.40±0.76 sec and 10.2±7.8 - 10.2±7.5 rep.). ISAF also significantly improved in 5.000 loaded run (29.2±3.1 - 27.4±3.0 min) while Control worsened significantly (26.4±2.9 - 27.8±2.6 min). Performance changes in 5.000 m loaded run and pull-up tests significantly correlated with changes in body mass and body fat. Maximum relative power output during bench press did not change significantly in either group. Serum glucose and creatinine decreased (5.46±0.53 - 4.87±0.74 mmol/l and 87.4±10.7 - 80.9±10.2 µmmol/l, respectively) and hematocrite increased (45.3±1.5 - 48.1±2.4 %) in ISAF significantly. To conclude, 6-month ISAF deployment induced positive changes in some performance and biochemical parameters. However, especially the performance changes may be explained primarily by the decrease in body mass and total body fat.

Poster session P3 ID-119

New clinical standards for the parameters of stabilometry: differences for gender and age.

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Stabilometry is an electrical system which measures and studies a person's oscillations in an upright position, in order to bring them back to stability (anti-fall system). In 1985 l'Association Française de Posturologie (AFP) published the standards for several postural parameters obtained from a normalized platform (Normes 85-AFP, 1986). Whereas before, with the 1985 AFP norms, the disclosure of the postural parameters occurred in the laboratory, in a booth with the subject isolated from the surrounding environment, now the measurements were taken in a clinic, in an open environment (open field) following the same criteria (normal brightness, without visual or autitory stimulus, placed with the feet at 30 degrees, on top of a new platform which allows the recording at 40hz, of the feet separately, likewise with the heel and the ball of the each foot, in eyes-open/shut, static mode for a time of 51.2 secs). The aim of this research was to record all the postural parameters, in subjects of different gender and ages, and thereby establish a new, significant statistical standardisation from these parameters. The postural parameters allow us to diagnose the causes of postural imbalance. Over 4000 subjects aged between 5 and 87 took part in the study. Once the ctiteria for inclusion and exclusion had been applied, the sample size stood at 3972 subjects. The statistical analysis carried out for each parameter has highlighted a significant statistical correlation for differences in gender and age (Rossato et al., 2013).

References
1) A.F.P.(1984). Standards for building a vertical force platform for clinical stabilometry: an immediate need. Agressologie, 25, 9: 1001-1002, Paris, France.
2) Rossato M., Bourgeois P., Ouaknine M. (2013). Stabilometry Standard Guidelines 2011-2013 during Clinical Practice. Marrapese Editore, Roma.

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Poster session P2 ID-120

The seasonal changes in maximal strength and power in elite AFL

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The tracking and monitoring of physical performance in elite Australian Rules Football (AFL) has become an important component in athlete management. However, there is limited information on the seasonal variation of strength training in elite AFL, therefore, the aim of the current study is to examine the seasonal changes in maximal strength and power in an elite AFL team. Thirty-nine elite AFL players (age; 24 ± 4 years, height; 1.87 ± 0.07 cm, weight; 87 ± 8 kg) engaged in strength and power training throughout the competitive part of the season (March-August). Strength and power training was periodised into 3 phases, respectively, each containing 3 weeks. Once a week, load (kg) relative to body weight in a band assisted (power) or band resisted (strength) box squat was recorded. The set/rep range was kept to 2x2 or 3x2 dependent on weekly training load and the velocity in which each set/rep was performed was fixed at 0.8-1.0 m/s and monitored by force plate technology (PS-2142 PASPORT 2-Axis Force Platform, PASCO, USA). Power in the assisted squat significantly improved over the course of the season (Pre; 47 ± 5 kg, Post; 75 ± 13 kg $P < 0.001$), however, maximal strength improved only in the first block-phase (Pre; 140 ± 0.5 kg, Post; 157 ± 10 kg, $P < 0.05$) before returning to pre-training thereafter ($P > 0.05$). Relative to years of AFL experience, there was a significant difference ($P < 0.05$) in maximal power such that 4-7 years (63 ± 5 kg) are significantly more powerful than 0-3 years (59 ± 4 kg). There was no difference in maximal strength between years experience ($P > 0.05$). In conclusion, these data demonstrate that maximal power may be improved during competition, however, gains in strength are limited, supposedly due to the cyclical nature of competition.

Poster session P3 ID-121

Jump capacity asymmetry of the lower limb in healthy athletes: systematic review.

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INTRODUCTION: In order to determine the potential risks of injury and to optimize sport performance the lower limb power 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 in to consideration, the aim of this systematic review was to summon up the physiologic differences in 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 from the earliest record to January 1th, 2014. The inclusion criteria of the systematic review were: (a) transversal studies, (b) healthy athletes, (c) studies that 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 articles 20 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 adult 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 of the 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 two of the included articles determined the dominant leg using objective outcomes (the leg with better jump capacity). The rest of the articles described it subjectively (preferred leg for kicking, jumping…).
DISCUSSION: Given the small number of studies and the poor homogeneity on the assessments, this study couldn't calculate physiological normal value SI jump 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 is worth noticing that the most researchers suggested a 10-15% threshold of muscle asymmetry between legs to be considered a usual physiological normal difference (3).
Finally, in regard to future studies it's important to consensus which leg is chosen as the dominant in data analysis because the results could differ.

REFERENCES:
1. Menzel H-J, Chagas MH, Szmuchrowski LA, Araujo SRS, de Andrade AGP, de Jesus-Moraleida FR. Analysis of lower limb asymmetries by isokinetic and vertical jump tests in soccer players. J Strength Cond Res. 2013; 27(5):1370–7.
2. Ceroni D, Martin XE, Delhumeau C, Farpour-Lambert NJ. Bilateral and gender differences during single-legged vertical jump performance in healthy teenagers. J strength Cond Res. 2012; 26(2):452–7.
3. Hewit JK, Cronin JB, Hume P a. Asymmetry in multi-directional jumping tasks. Phys Ther Sport. 2012; 13(4):238–42.

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Poster session P3 ID-122

Response of bone metabolism to various resistance exercises in women – preliminary results

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The study examined acute response of bone metabolism to resistance exercise in young women (n=7). A randomized, repeated measures crossover design was used to find out the effect of two single sessions of different resistance loadings on a computer-controlled legpress dynamometer on serum amino-terminal propeptide of type 1 procollagen (P1NP) and serum beta crosslaps (bCTx). A session of either traditional constant resistance exercise against 70 % of individual 1RM (ISOF) or a serial stretch loading consisting of repeated (10 Hz) counter-movements in concentric and accelerations in eccentric phase in isokinetic mode (SSL) were applied in different days. In each session the subjects performed 6 sets of 6 repetitions with 1.5-minute resting periods. Four blood samples were obtained: fasting before, 15 minutes, 24 and 48 hours after the protocols. Both sessions were conducted in the morning, between 7:30 AM and 9 AM. Maximal isometric voluntary contraction (MVC) was measured before and after the exercise protocols. bCTx concentration decreased significantly 15 minutes after the exercise (42.0 %, $p<0.001$) and returned to baseline values 24 hours later. But it was significantly increased 48 hours after the loading when compared to its resting and 24-hr values (by 7.4 % and 8.3 %, respectively, $p<0.05$). Also P1NP decreased significantly 15 minutes (11.0 %, $p<0.001$) following the loading and returned to baseline values 24 and 48 hours after the exercise. However, its concentration 48 hours post exercise was significantly higher than 24 hours post exercise (4.3 %, $p<0.05$). Similar pattern of P1NP and bCTx change was found after both exercise protocols. MVC decrease was higher, though not significantly, after SSL then after ISOF (21.5 %, 13.6 %, respectively). The results indicate that significant exercise-induced changes of bone metabolism can be observed no sooner than 48 hours after the intervention, regardless of the type of resistance loading.

Poster session P3 ID-123

Effects of functional electrical stimulation and strength training with proprioceptive stimulation on muscle strength and function in elderly

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Both, functional electrical stimulation and voluntary strength training are known to improve strength capabilities and motor functions. The present study compared the effects of an 8-week (3 times per week) period of functional electrical stimulation and strength training with proprioceptive stimulation in elderly. Twenty nine participants were randomly divided into strength training group (ST) or functional electrical stimulation group (FES). ST (n= 15, 71.7 ± 2.97 years) trained on a computer-controlled leg press device in proprioceptive stimulation mode. EST (n= 14, 70.2 ± 3.26 years) underwent surface electrical stimulation of both knee extensors muscles with an additional load placed on ankles (1 to 2,5kg). Before and after the intervention, subjects were tested for isometric muscle strength of knee extensors, habitual and maximal walking speed over 10 m and chair-rising test. After the training, isometric muscle strength increased in both ST and FES from 222 ± 68.5 Nm to 236 ± 64.5 Nm and from 232 ± 77.6 Nm to 248 ± 65.7 Nm, respectively, with no difference between groups (main training effect, $p=0.003$). In chair-rising test the sit-to-stand time decreased from 12.5 ± 1.7 s to 10.4 ± 1.2 and from 13.1 ± 2.1 s to 10.8 ± 1.7 s in ST and FES, respectively ($p<0.001$). Habitual walking speed did not changed significantly in either group. Maximal walking speed test decreased in both ST from 5.05 ± 0.52 s to 4.80 ± 0.66 s and FES from 5.96 ± 1.08 s to 5.52 ± 0.87 s, with no difference between groups (main training effect, $p=0.048$). In conclusion, both strength training with proprioceptive stimulation and functional electrical stimulation similarly improve the maximal strength and motor function in elderly. Both methods represent an effective and safe way for improvement of strength and functional capabilities in sedentary elderly people.

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Poster session P3 ID-124

Genetic polymorphisms and athletic performance:an assessment on semi-professional soccer players

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ABSTRACT

The aim of this study was to determine the probability of individuals having the best genetic background that could increase performance, evaluating the polymorphism that are considered Performance Enhancing Polymorphism (PEPs) distributed on five genes: PPARα, PPARGC1A, NRF2, ACE e CKMM.

Sixty professional italian soccer players (age 22.5 ± 2.2) and thirty 30 healthy volunteers (age 21.2± 2.3) were enrolled. The PEPs analysis assess the relationship with endurance performance as well as muscle performance both required in different roles of soccer players. Samples of venous blood were obtained by standard clinical procedures and anticoagulant-treated blood was used to prepare genomic DNA. The results evidence some differences on polymorphism distribution between soccer players and healthy volunteers.

PPARα genotype distribution of GG, GC e CC was respectively: controls (48%, 44,5% and 7,5%) and soccer players (64%, 32% and 4%). A strong significance of G allele was found on soccer players (80% soccer players and 70% controls; p = 0,04).

PPARGC1A Ser482Gly have shown the following distribution of GG, SG and SS: controls (29,6%, 59,2% and 11,1%) and soccer players (40,6%, 49,1% and 10,1%) (p=0,61).

NRF2 polymorphisms (C/T and A/G) have not shown a significant difference in both groups.

CK-MM genotype distribution of AA, AG e GG was: controls (33,3%, 55,5% and 11,1%) and soccer players (45,7%, 42,3% and 11,8%) (p=0,50).

A strong statistical significance was found on ACE polymorphism; DD, ID and II was: controls (70,3%, 29,6% and 0%) and soccer players (47,4%, 35,5% and 16,9%) with pValue of 0,003.

In conclusion professional soccer players seem to possess “theoretically” a genetic background that is more suitable for alternating anaerobic-aerobic performance.

References

- Proia P, Bianco A, Schiera G, Saladino P, Pomara F, Petrucci M, Traina M, Palma A The effects of a 3-week training on basal biomarkers in professional soccer players during the preseason preparation period. J Sports Med Phys Fitness 2012, 52(1):102-106.
- Eynon N, Ruiz JR, Meckel Y, Moràn M and Lucia A Mitochondrial biogenesis related endurance genotype score and sports performance in athletes. Mitochondrion 2011; 11(1):64–69.

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Teresio Rossello portò un campione dell'acqua a un chimico, il dottor Barbera, dell'Istituto tecnico Quintino Sella di Biella: "Quest'acqua è semplicemente eccezionale", fu la risposta. Seguirono esami più approfonditi all'Istituto di Chimica dell'Università di Torino. Il risultato confermò il giudizio del dottor Barbera. Rossello fondò allora una società a gestione familiare, che nel 1964 fu trasformata in Accomandita semplice, con la partecipazione di nuovi soci. Fu costruito uno stabilimento a circa 850 metri di altitudine nei pressi della fonte, nel quale, direttamente dalla stessa, veniva convogliata l'acqua per caduta spontanea attraverso tubazioni in acciaio inox. L'attività di imbottigliamento iniziò nel 1965 e l'acqua commercializzata fu denominata Lauretana in onore alla Madonna di Loreto venerata nel Santuario di Graglia. Nel giro di alcuni anni l'azienda si espanse. Furono ampliati gli edifici industriali e vennero installate nuove linee di imbottigliamento.

Il momento decisivo per il successo arrivò molti anni dopo, con Antonio Pola, amministratore delegato, al fianco del presidente Giovanni Vietti i quali con una strategia tesa a valorizzare le caratteristiche del prodotto, prima fra tutte la "leggerezza", portarono la Lauretana ad essere proclamata da molti consumatori la migliore acqua europea, sicuramente la più leggera d'Europa per i suoi valori organolettici accertati da analisi effettuate da medici di fama internazionale. Grossi investimenti sono stati oculatamente compiuti e continuano a essere fatti, sia sugli impianti di produzione, sia sulle attrezzature. Oggi le linee di produzione sono completamente rinnovate. Naturale come sgorga dalla sorgente, leggermente frizzante o frizzante per gli amanti dell'acqua gasata, Lauretana è venduta in diversi formati.

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Nel 1911, abbracciando una storica tradizione lunga 500 anni, nasce l'azienda erboristica Gianluca Mech S.p.A. Le prime notizie risalgono, infatti, al 1500. Esse sono strettamente intrecciate alla storia di una speciale formula galenica denominata 'Decottopia®', che lega sinergicamente più di dieci piante senza l'utilizzo di alcol, senza zuccheri e senza conservanti. Originariamente, la Decottopia®' sarà segreto e proprietà di una ristretta comunità protestante piemontese originaria della Svizzera, che col passare del tempo verrà gradualmente assorbita dalla comunità cattolica locale, tramandando questa lavorazione erboristica alla famiglia Bonardo che, agli inizi del '900, prenderà il nome Balestra e, successivamente, Mech.

Le notizie sull'attività erboristica della famiglia Bonardo si hanno a partire dalla fine del XVIII secolo. Per altri cento anni la famiglia e la pratica della Decottopia® rimarranno in Piemonte. Poi, nel 1899, Giuseppina Bonardo sposando Marcello Balestra, si trasferisce in Veneto.

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Con l'avvento dei prodotti farmaceutici, la tradizione galenica perderà presa sui consumatori cambiando lo scenario di mercato. E' allora che Adelaide Balestra, con il guizzo tipico di una esperta di marketing, crea un nuovo posizionamento trasformando temporaneamente i suoi estratti d'erbe in 'amari', primo tra tutti il famoso storico amaro Balestra.

Ad oggi la Decottopia® cuore di Gianluca Mech Spa, è il vero motore trainante di tutti i progetti successivi aziendali, compreso lo sviluppo della Tisanoreica®, l'esclusivo protocollo dietetico ideato da Gianluca Mech. Attuale erede della lunga tradizione erboristica di famiglia è Gianluca Mech. Ancora adolescente quando viene indicato come il testimone della sua generazione, acquisisce l'attività di famiglia negli anni '80. Favorito dalle competenze maturate accanto al padre Giovanni e alla nonna novantenne, rinnova e perfeziona la Decottopia®, genera dalla stessa la dieta Tisanoreica®, introducendo man mano una serie di altre innovazioni di prodotto all'avanguardia, sempre partendo dalla stessa matrice e mantenendo intatta la propria identità aziendale radicata nella tradizione centenaria.

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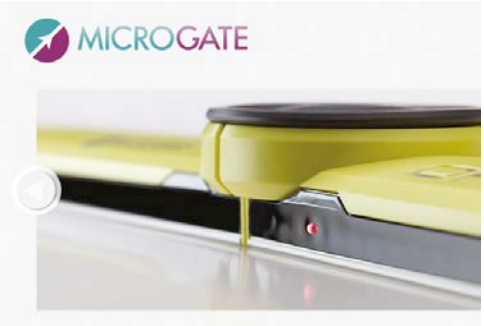
Per consentire l'aggiornamento costante dei propri associati, la F.I.F. promuove, attraverso un centro servizi convenzionato (centro studi "la torre") anche un settore editoriale che produce materiale didattico (dispense ed audiovisivi) specificamente legato al fitness.
Tra le attività editoriali, un ruolo importante è ricoperto dalla rivista "performance", distribuita gratuitamente in oltre 40mila copie a numero a tutti i tesserati della associazione, a palestre ed istruttori e a tutti gli operatori sportivi italiani. La rivista affronta argomenti legati alla nutrizione, alla medicina sportiva, alle metodiche di allenamento, ma anche alle nuove tecniche e alle nuove metodologie di insegnamento.
Negli ultimi tempi è stata avviata anche una seconda iniziativa editoriale, con la rivista di danza "expression", distribuita in oltre 20 mila copie a numero, a tutti gli associati, a ballerini, scuole di danza, allievi e a tutti gli operatori di settore. Nel settore scientifico esiste una rivista di approfondimento denominata kinesis che ha lo scopo di fornire un contributo di alto profilo scientifico per gli associati che intendono entrare nei dettagli più tecnici delle ricerche legate al mondo del fitness e wellness.



www.microgate.it

Fondata a Bolzano nel 1989 dai fratelli Vinicio e Roberto Biasi con l'obiettivo di creare sistemi di cronometraggio sportivo, Microgate ha ampliato col tempo il proprio know-how e la propria rete di partner per affrontare sempre con successo nuove sfide. Particolarmente sensibile a design e innovazione, oggi l'azienda è attiva in quattro settori di sviluppo (Timing, Training & Sport, Medical Rehab ed Engineering), copre con la sua rete di vendita 30 paesi in 4 continenti e tra i suoi clienti figurano l'European Southern Observatory, la Federazione Italiana Cronometristi, la Federazione Italiana di Atletica Leggera, i più prestigiosi club di calcio europei e le cliniche riabilitative più importanti in Italia e all'estero. Nel 2010 è stata fondata Microgate USA con sede a Mahopac, NY.

Dal 2004 l'azienda ha dato vita a micro photon devices, una compagnia compartecipata dal Politecnico di Milano. Il primo prodotto dello spin-off è un contatore di fotoni, già acquistato da NASA, Hewlett-Packard, Novartis, MIT, con grandissime potenzialità di applicazione nell'ambito delle tecnologie biomedicali, industriali e astronomiche.

All'interno dello stabilimento di Bolzano, Microgate segue l'intero processo di sviluppo tecnologico, dalla progettazione alla prototipizzazione sino alla produzione. Una trentina di dipendenti, di cui 9 ingegneri specializzati nei diversi rami (elettronica, informatica, aerospaziale), rappresentano il cuore dell'azienda. Operando ai confini dell'evoluzione tecnologica, per Microgate la formazione e la ricerca, a contatto con i più avanzati centri di sviluppo internazionali, sono una priorità assoluta.

Noi, le sorelle gamberi, due donne un po' fissate sul voler essere magre a tutti i costi, come tante. Il problema del sovrappeso, comune a molte persone. Quindi diete, poi ancora diete, e fame. Una settimana di dieta per perderete qualche etto, un'uscita a cena per aumentare di un chilogrammo. Abolite le cene fuori. Discriminazione. Fame, tristezza, malumore. Pochi i negozi in cui vestire oltre la taglia 44. D'obbligo i negozi "taglie forti". Altra discriminazione. Drastica decisione: "elimino i carboidrati". Quindi niente più dolci, pasta, pane e pizza. Tanto parlare della dieta "atkins": carne e grassi a volontà. I primi esperimenti. Funziona. Ma difficile resistere nel tempo mangiando solo carne e grassi. E quando il desiderio di carboidrati diventava insopportabile si ricadeva nel solito baratro. Mangiarne. Con sempre maggiori sensi di colpa per la poca forza di volontà. Perciò ancora digiuni alternati ad abbuffate. Peso sempre in aumento. Mancava quell'alimentazione tradizionale a cui la nostra società ci ha abituati composta da pasta, pane e soprattutto dolci vari per saziare vuoti causati da mille motivi. Continuarono perciò i nostri tentativi, fino a che riuscimmo a mettere insieme qualcosa di analogo ai carboidrati che potesse sostituire quei prodotti farinacei ormai forzatamente abbandonati ma mai dimenticati. Chiedemmo all'amico cardiologo prof. Franco rusticali cosa pensasse di questo tipo di alimentazione. Risposta decisa: "va bene. Mangiamo tutti troppi carboidrati". Da qui l'inizio, un inizio pieno di speranze condiviso con amiche come noi in sovrappeso ed affamate. Ed ecco i primi simil-panini, le prime simil-paste, i primisimil-biscotti e simil-tutto: croissant, pizze, crostini, crackers, grissini, plum cake, cioccolata e quant'altro. Prodotti con un irrilevante contenuto di carboidrati composti da proteine vegetali e fibre vegetali. Prodotti aglucidici. Ottimi anche gli alimenti che insieme a questi prodotti si potevano mangiare: carni, pesci, insaccati, formaggi stagionati…. Tutto un po' strano ed incomprensibile. Finalmente però si tornò a vivere una vita normale. Mai fame. Forse un po' insolito" quel sacchettino di simil-carboidrati" che sempre ci accompagnava. Ma calavamo. E mangiavamo. E calavamo. Dopo qualche tempo avevamo perso quell'odiato grasso di troppo che aveva lasciato il posto ad un costante e continuo buonumore. Era la realizzazione di un sogno: niente più diete, niente più fame, niente più ferree autodiscipline, arrabbiature e malumori. Uscire di nuovo serenamente a cena con gli amici. Vedere una vetrina e poter entrare nel negozio certe di trovare la nostra taglia. Autostima finalmente in costante aumento. Noi eravamo talmente entusiaste di tutto ciò che oramai, sollecitate da domande poste da chi ci conosceva e notava il nuovo aspetto, non parlavamo quasi d'altro.

Le parole viaggiarono veloci quanto la luce fino al momento in cui, dovunque andassimo, chi ci incontrava ci chiedeva informazioni su questo modo di mangiare e sulla possibilità di procurare un po' di quel cibo. Così arrivò l'idea di inventare un nuovo mestiere: fornire alle persone affamate e tristi come lo eravamo state noi cibo che permettesse loro di mangiare ogni volta che volevano senza limiti di quantità. Era arrivato il momento di fornire alle persone prodotti che permettessero di mangiare e dimagrire. E visto che era nato anche tutto un mondo di curiose scoperte legate all'eliminazione dei carboidrati e all'utilizzo di questo cibo si è incaricata l'Università degli studi di Padova - Facoltà di Medicina e Chirurgia - di eseguire studi e sperimentazioni in merito all'utilizzo di questo regime alimentare per dimagrire.
La consulenza scientifica è stata assegnata al prof. Antonio Paoli dell'Università degli studi di Padova. Era nato il mondo le gamberi foods. Abbiamo capito poi che avevamo iniziato il nostro percorso di alimentazione chetogenica che, strada facendo, è diventato sempre più "il nostro mondo", quello in cui ci siamo specializzate, che continua tuttora ad essere in evoluzione ampliando la possibilità del suo utilizzo e sui nostri prodotti abbiamo depositato un brevetto per poterne mantenere la loro autenticità. Per meglio consentire alle persone l'immediatezza di identificazione delle caratteristiche dei nostri prodotti è giunto un rinnovamento:
Le gamberi ketogenic foods.
Da quel momento sono passati oltre dieci anni, abbiamo aperto altri negozi e trovato altri canali di distribuzione.

E la nostra storia continua...

Marina Marisa Gamberi

www.calzetti-mariucci.it

La casa editrice Calzetti & Mariucci, nata nel 1993, pubblica libri, video e riviste per lo sport e il movimento di autori italiani e stranieri di fama. Il catalogo comprende libri di testo, manuali, riviste, software, video e dvd sia per l'addetto ai lavori che per il semplice praticante che voglia documentarsi e che intenda migliorare la qualità della propria vita attraverso l'esercizio regolare di movimento e di sport.

Il catalogo comprende una vasta gamma di specialità sportive: dagli sport individuali a quelli di squadra, da quelli di combattimento a quelli tecnico-combinatori. Nelle pubblicazioni si affrontano gli aspetti più o meno complessi dell'apprendimento, dall'iniziazione alla pratica di alto livello, ivi inclusi gli aspetti scientifici della pratica.

La validità scientifica e tecnica di ogni pubblicazione è garantita dalla possibilità della casa editrice di avvalersi della consulenza di istituzioni quali la Scuola dello Sport, il Comitato Olimpico Nazionale Italiano e varie Federazioni, tra cui – attualmente – la FIPE, Federazione Italiana Pesistica, la FIPAV, Federazione Italiana Pallavolo, e la FIP, Federazione Italiana Pallacanestro.

http://cosmoproject.it

Cosmoproject è un'azienda chimica specializzata nella ricerca, progettazione e implementazione di prodotti cosmetici innovativi e all'avanguardia. Dotata di grande esperienza, know-how e personale qualificato, offre ai clienti un servizio personalizzato e completo, nella logica del più moderno full-service. La capacità di rispondere alle più specifiche esigenze del mercato con prodotti altamente performanti e perfettamente dermocompatibili si integra con una filosofia di attenzione all'ambiente; questo fa di Cosmoproject l'interlocutore preferenziale per un sicuro successo nei mercati mondiali. Il contesto: Parma

PASSIONE E TRADIZIONE

Cosmoproject nasce nel 1993 a Parma, città nota a livello internazionale per la cultura, l'arte e la gastronomia, ma anche città con un'origine storica particolare: il profumo.

L'attività essenziera che si sviluppa nell'800 dà vita al profumo preferito dalla consorte di Napoleone Bonaparte, Maria Luisa d'Austria: la famosa Violetta di Parma. Da allora la città viene unanimemente riconosciuta come piccola capitale del profumo.

In questo contesto si sviluppa un forte comparto produttivo cosmetico e si innesta Cosmoproject, un'azienda che mantiene un pensiero rivolto alla tradizione del territorio e uno sguardo orientato verso il mondo, per un perfetto equilibrio tra sapere e fare.

VITAMINCENTER

www.vitamincenter.it

Vitamin Center è l'azienda italiana leader nella distribuzione di integratori alimentari per sport, salute e benessere, di prodotti naturali, biologici, estetica viso e corpo, abbigliamento e accessori sportivi.
Nata nel 2002 da una brillante intuizione, l'azienda ha sempre perseguito una politica di estrema cura e attenzione verso il cliente, conquistandosi un posto di prestigio nel mercato della distribuzione on-line multimarca.
Il portale www.vitamincenter.it è lo strumento su cui si basa l'attività dell'azienda e su cui sono offerti servizi integrati sia per il consumatore attento alla salute che per lo sportivo.
Attraverso la cura nella selezione dei prodotti offerti, l'attenzione al giusto prezzo e la politica di sviluppo delle tecnologie connesse alla vendita on-line, Vitamin Center offre ai propri clienti un'esperienza di acquisto sicura e senza sorprese.
Una struttura completamente informatizzata e la totale integrazione dei servizi web, amministrativi e logistici sono il fiore all'occhiello di Vitamin Center srl e la chiave di volta per la rapidità e l'efficienza con cui si effettuano le consegne degli ordini.
Vitamin Center è un'azienda completamente italiana ed è orgogliosa di apportare il suo contributo operando nel pieno rispetto delle regole e delle leggi italiane.

www.technogym.com

IT. Da oltre 25 anni ci preoccupiamo di diffondere la cultura del vivere sani e in forma nel mondo. Scopri chi siamo e il significato di Wellness Company.
La visione e l'assoluta dedizione alla promozione del Wellness, ossia uno stile di vita migliore fondato su un'attività fisica regolare, un'alimentazione sana e un approccio mentale positivo, costituiscono l'etica di Technogym® da oltre un ventennio. L'innovazione a 360°, l'offerta di una Total Wellness Solution™ e la filosofia che da sempre coniuga il business con la responsabilità sociale sono gli elementi distintivi che fanno di Technogym l'unica 'Wellness Company'.
Era il 1983 quando il presidente e fondatore, Nerio Alessandri, creò la prima attrezzatura fitness nel suo garage, ad appena 22 anni. Technogym è oggigiorno un'azienda leader nel settore del Fitness & Wellness con oltre 2.200 dipendenti, 14 filiali in Europa, U.S.A., Asia, Medio Oriente e Australia. Oltre 65.000 centri Wellness e 100.000 abitazioni private in tutto il mondo sono attrezzate Technogym.

EN. For over 25 years we've endeavoured to spread the culture of healthy living and good shape around the world. Find out who we are and what THE WELLNESS COMPANY™ means.
Vision and a total commitment to promoting Wellness, a better lifestyle through regular physical activity, healthy diet and a positive mental approach, have been the ethos of Technogym® for over 2 decades. All around innovation, a Total Wellness Solution™ and the founding philosophy of fusing business with social responsibility set Technogym, THE WELLNESS COMPANY™ apart.
President and founder, Nerio Alessandri, developed his first fitness equipment in his garage in 1983 at the age of 22. Technogym is today a leading company in the Wellness and Fitness field with over 2,200 employees, 14 branches in Europe, U.S., Asia, Middle East and Australia. More than 65,000 Wellness centres are equipped with Technogym and 100,000 private homes all over the world.

www.syform.com

NEW SYFORM

New Syform ufficialmente sorge nel 1999 a coronamento di una lunga esperienza precedente vissuta nel settore della nutrizione per lo sport, per opera di Leopoldo Moretto e di Maurizio Mattia. Il primo, farmacista, terminato il percorso di studi con una tesi di laurea dal titolo "Aminoacidi ramificati e performance", cui ha fatto seguito un master in fitoterapia presso l'università di Siena, si è sempre occupato di ricerca e formulazione di integratori alimentari per lo sport & wellness. Il secondo ha vissuto una lunga esperienza come physic trainer, procuratore di atleti dal valore internazionale, è specialista in tecniche di allenamento con i pesi. Ai due si unisce sin dall'inizio Erica Pietrobon, attuale amministratore della società. Ricordiamo anche, con gratitudine ed affetto Umberto Andreotti, socio di capitale sin dall'inizio, a qualche anno ormai dalla prematura scomparsa. La sua saggezza, equilibrio e competenza informatica sono stati preziosissimi per iniziare questa avventura.

PRESS COMPANY PROFILE

New Syform s.r.l. è una azienda italiana che opera dal 1999 nella ricerca, sviluppo e commercializzazione di integratori alimentari per lo sport e per uno stile di vita equilibrato e moderno. La nostra mission è creare integratori d'avanguardia coniugando i migliori, più efficaci e sicuri principi attivi ottenuti dal mondo vegetale, con la sperimentazione e la ricerca in laboratorio, per rispondere alle esigenze sempre più specifiche del consumatore finale. Grazie ad una stretta partnership con un laboratorio di ricerca, sviluppo e produzione, abbiamo la possibilità di progettare, mettere a punto e realizzare la nostra filosofia aziendale fondata sulla qualità del prodotto, sempre in divenire. L'innovazione e qualità formulativa sono il caposaldo degli integratori Syform, azienda che da diversi anni è impegnata nel mondo dello sport professionistico, ritenendo l'atleta di livello, un importante riferimento per approfondire le dinamiche di utilizzo e migliorare la qualità del prodotto.

Nel recente passato abbiamo partecipato attivamente ai progetti di collaborazione con Benetton basket, Sisley volley, Benetton rugby, Pietro Piller Cottrer, ora siamo attivamente impegnati con la Pallacanestro Trieste e Pallavolo Padova in veste di sponsor tecnico, nel mondo del nuoto con ADN Swim Project, un prestigioso team di nuotatori di valore mondiale, tra cui Evgeny Korotyshkin medaglia d'argento nei 100 farfalla alle recenti Olimpiadi. Anche il campione mondiale di kick boxing, Giorgio Petrosyan, che recentemente ha vinto il "Glory" di Roma da diversi anni utilizza con successo i nostri prodotti.

Human Kinetics

About Human Kinetics

www.humankinetics.com

At Human Kinetics, our mission is to produce innovative, informative products in all areas of physical activity that help people worldwide lead healthier, more active lives.

Human Kinetics is committed to providing quality informational and educational products in the physical activity and health fields that meet the needs of our diverse customers. Within the physical activity field, recreational and organized sports are a major focus.
Our customers include scholars who study physical activity and health issues; professionals who apply sport, physical activity, and health knowledge in delivering useful services; and the public who engage in fitness and sports activities in many forms and who benefit from living healthier lifestyles. We are committed to providing not only information but also solutions that help our customers practice their professions better and live healthier, more enjoyable lives.
We are committed to providing accurate, useful information and education, packaged and delivered at affordable prices with technology being a key driving force in improving our products and their accessibility. We are committed to being a leader in our field through innovation and expansion around the world.

www.elasticinterface.com

WHAT IS IT?

ELASTIC INTERFACE® is the brand that CyTech, a young company (founded in 2000), creative and marketing oriented, has been able to promote in the world in a very short time, as the top and most certified reference in the sector of protection pads for cycling shorts. Administrative offices are in San Vendemiano (TV) Italy and production facilities are in the immediate surroundings, less than an hour away.

PASSION AND INNOVATION

The Company is the result of the passion of two managers, Stefano Coccia and Marino De Marchi, the latter also a very passionate cyclist. For the first time in history, Elastic Interface® applies concepts of R&D, sophisticated design and hi-tech to an accessory often underestimated, albeit paramount: the cycling pad (or chamois) for the cycling shorts.

ELASTICITY 360°

With the logo Elastic Interface® Technology (in short EIT) and the innovative technology applied to its pads, the Company has changed the history of the cycling shorts: chamois with 360° of elasticity, designed to adhere like a glove to the body of the cyclist and improve his/her performance. Indeed, a lot depends on the right chamois that, with the saddle and the cyclist's posture, can decide or affect the athlete's performance. The EIT products are CyTech patented and today they are considered the reference standardworldwide.

K-WELL®

www.kwell.it

K-Well/Tecnocomponent è un'azienda specializzata nella produzione e commercio di accessori e prodotti innovativi per il fitness, ecco il nostro Company Profile.
Nata come azienda commerciale, nel corso degli anni si è trasformata in un' impresa produttrice, rilanciando tramite acquisizione di brand e linee produttive, marchi storici del mondo del fitness. Il Fitboxe e lo step Aerobika sono l'esempio più importante e di successo del progetto.
K-Well/Tecnocomponent acquisendo i marchi, gli stampi e collaborando con gli storici artigiani, ha unito l'esperienza con la qualità, dando nuovo vigore alMade in Italy.
Da più di dieci anni la passione per lo sport e la professionalità sono al servizio di palestre, club sportivi e centri di riabilitazione. La lunga esperienza maturata nel settore dai nostri collaboratori e la visione a 360° del nostro staff di professionisti, ci rendono capaci di comprendere e soddisfare le esigenze dei vari clienti:

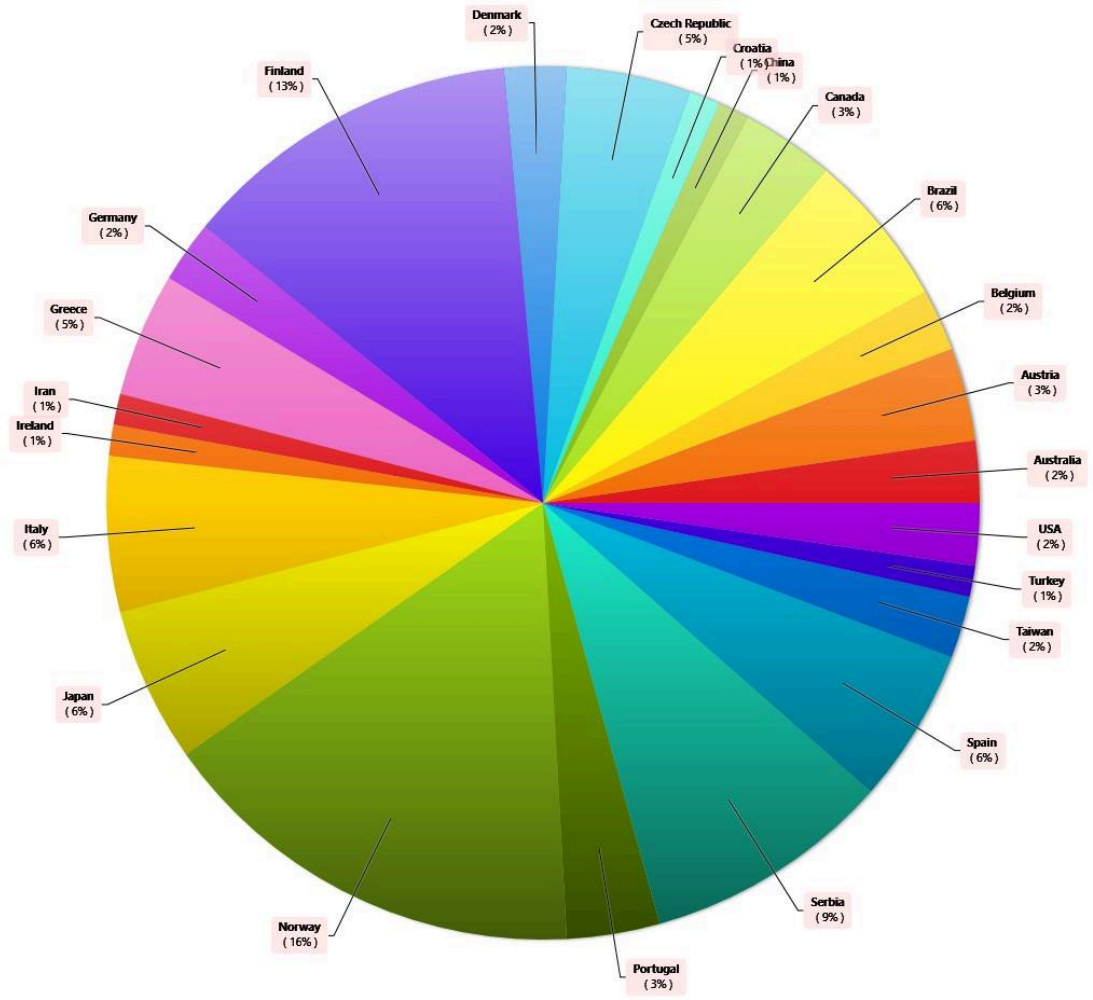
- Titolari di palestre
- Catene di fitness
- Personal trainer
- Istruttori di pilates, fitness, aerobica
- Gestori di centri sportivi
- Associazioni sportive
- Professionisti della riabilitazione e della rieducazione funzionale

K-Well/Tecnocomponent produce da sempre articoli di qualità, testati dai principali master trainer italiani. A distinguerla è soprattutto un talento: la capacità di capire in anticipo ciò che è destinato a lasciare il segno nel mondo del fitness.
Negli ultimi anni l'azienda è entrata nel mercato europeo ed ha allargato le linee di prodotti in particolare con Rebgym e Trakfitness, promuovendoli alle fiere e riscuotendo, da subito, un grande successo.
Crediamo fermamente che una persona in forma sia anche una persona felice.

ESSENTIAL

Integratori per lo sport e per il fitness.

Where do abstracts come from?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