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# **Book of Abstracts**

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## Poster Presentation

### Motor Learning

P54K

**P54K01**

#### Comparison of a 10 week resistance strength training program, in muscle morphology, electromyography activity and strength gains on prepubescent girls and boys

Monteiro António Miguel, Lopes Vítor, Faro Ana  
(Higher School of Education, Polytechnic, Bragança, Portugal)

The mechanisms that are behind the strength gains, in strength training programs, are not still well evidenced. It seems to exist the certainty that strength training produces greater gains, during puberty and after, in virtue, over all, of the increase of serum testosterone, which allows an increase of muscle hypertrophy. Strength gains gotten before puberty, will be resultant of neurological adaptations, such as, the improvement of inter and intra-muscle coordination and order, the synchronization, the amount of motor units recruited, and the frequency of nervous stimulus, and not so much due to hypertrophy. The purpose of this research was to compare the maximal voluntary isometric force (MVIF), the electromyography activity (EMG) and the muscle thickness between pre-pubertal boys and girls.

The results suggested that prepubescent children can increase strength following a strength training program that includes callisthenic exercises. There were no significant differences on the MVIF between boys and girls doing the triceps press exercise. The strength gains were not followed by an increase of muscle mass. In the same way, there were no significant differences according to gender on the thickness of the triceps of the both arm of the triceps. It seems that the elements underlying the increase and strength gains can be related to the increase of the coordination of the movement. The coordination seems to be an element that highly contributes to the increase of strength for more complex exercises.

*Keywords* : resistance strength, prepubescent, muscular and neuromuscular

**P54K02**

#### Muscle fatigue during concentric and eccentric contractions in elderly subjects

Baudry Stéphane, Klass Malgorzata, Duchateau Jacques  
(Université libre de Bruxelles, Belgium)

The purpose of this work was to compare muscle fatigability during CON and ECC contractions in elderly subjects and to determine the relative contribution of central and peripheral mechanisms to the decline in force.

Nine subjects (70 to 85 yr) performed two fatiguing exercises (CON or ECC) with the ankle dorsiflexor muscles. Each fatigue test consisted in 5 sets of 30 maximal isokinetic contractions with 1 min rest between each set. The torque produced by the dorsiflexors and the surface electromyographic activity (EMG) of the tibialis anterior were recorded throughout the fatigue tasks. After each set of contractions and during 30 min following the fatigue test, fatigue was assessed by the twitch-interpolation method during maximal isometric voluntary contraction (MVC), as well as electrically-induced contractions in response to single and paired maximal stimuli.

At the end of the fatigue tests, the two contraction types led to a similar torque (55.4 +/- 2.8 %; 52.1 +/- 2.3 %; P<0.001) and EMG (- 34.1 +/- 3.5 % vs - 37.8 +/- 3.5 %; P<0.05) decrease. Similarly, the MVC torque was progressively reduced in both protocols but ECC contractions showed lower recovery than CON ones (77.1 +/- 6.2 % vs 89.3 +/- 5.7 %; P<0.05) 30 min after the end of the fatigue test. No change was observed neither for data recorded from the twitch-interpolation method nor for EMG/M-wave ratio. After the fatiguing CON and ECC contractions, the M-wave was reduced by 25 +/- 10.1 % and 15.1 +/- 5.1%, (P<0.05) and the twitch amplitude by 58.4 +/- 5.8 % and 58.1 +/- 8.1 % (P<0.001), respectively. However, the mechanical responses to electrical stimulation remain depressed during the recovery period while the M-wave returned rapidly to its control values.

The absence of change in EMG/M-wave amplitude ratio and data recorded from the twitch-interpolation method suggest that

reduced voluntary activation did not play a role in the observed force decrease during the two fatiguing tasks. In contrast, the observation that the mechanical responses to electrical stimulation were reduced after fatigue and remained depressed during the recovery period, at a time the M-wave had fully recovered, suggests that mechanisms located beyond muscle membrane play a dominant role. It is concluded that force decline, during repetitive CON and ECC contractions, is mainly related to the alteration of the excitation-contraction coupling. This study is supported by the European Commission (GRANT # QLK6-CT-2001-00323)

*Keywords* : ageing, fatigue, electromyography

**P54K03**

#### Measurement of the contact force between runner and ice for bobsleigh

Hainzmaier Christian, Wimmer Hans, Kleemann Roland, Sander Erwin, Wintermantel Erich  
(Munich University of Technology, Germany)

Runner design in bobsleigh engineering is still based on empiric data and experience from geometry and material field testing. This is surprising as the runners play a major role in total performance of a bobsleigh team. Data about forces, vibration frequencies and induced stress and strain states are needed. In this study the contact force between runner and ice for a 2-men bobsleigh on the track of Koenigssee, Germany was determined.

Triangular strain gages were mounted close to the running surface onto one side of each of the 4 runners. Linear strain gages were mounted on both sides of the runners for temperature compensation. The sensor location was optimized by applying a point load to the surface of the runner using a compression testing machine. The axis of the bobsleigh were instrumented by strain gages to measure the bending of each axis. Data were acquired during real bobsleigh runs for a time period of about 50s.

On-board instrumentation consisted of amplifier, mobile data logger and energy supply. Precautions were taken for the stabilization against accelerations of more than 10g. Temperature resistance down to -30°C was assured. 48 strain gages were measured simultaneously at two frequencies (100 Hertz and 2400 Hertz). 32 runs were recorded with different pilots and bobsleds.

Data were in very good agreement to the course of the bobsleigh track. The prominent points of the bobsleigh track could be reproduced very well by the distribution of normal forces. It could be calculated that, during the run, a maximum of normal acceleration of sixfold gravity is applied to the bobsled and the team. For a 4-men bobsleigh this means a maximum load applied to each runner of up to 9000N. It was found that impacts mainly affect the front third of the runner. New runner designs will be developed in the near future taking the results of this study into account.

*Keywords* : bobsleigh sports, contact force, normal acceleration

**P54K04**

#### Is there a generalization of balance ability for elite gymnasts?

Asseman F, Caron O, Crémieux J  
(Université Sud Toulon-Var, France)

The aim of this study was to analyse if the expertise in gymnastics, including the mastering of various difficult postures, can be generalized to usual upright postures. For that purpose, the balance of elite gymnasts was firstly compared to other sportsmen with the eyes open in two postures. Then, to study if the expertise in gymnastics had an effect on visual information's preponderance during postural maintenance, the subjects were compared in the same postures but with the eyes closed.

13 elite gymnasts and 13 other sportsmen were instructed to stand as still as possible during 32s in two postural tasks: bipedal and unipedal with the eyes open and with the eyes