Negative energy balance is highest in female athletes retiring from competitive career

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Introduction: Evidence suggests that a negative energy balance rather than engaging in competitive sports serves as a trigger factor in the pathogenesis of athletic amenorrhea. The purpose of this study was to evaluate energy balance of adolescent females competing in different types of sport.

Methods: Energy intake (EI) and energy expenditure (EE) were calculated in females (16.3 ± 2.0 years, students at elite school of sports) engaged in endurance (E, n = 16), power (P, n = 22) or team sports (T, n = 12) using 4-day dietary reports and 7-day activity protocols. Results were compared to data of athletes retired from competitive career (R, n = 8) and age-matched controls (C, n = 12). Voluntary restricted eating was assessed by questionnaires. Analysis was carried out using descriptive statistics and ANOVA (p < 0.05).

Results: There were no differences in EI between athletes (E = 9.15 ± 2.3 MJ/d, P = 9.65 ± 3.0 MJ/d, T = 9.98 ± 2.5 MJ/d) and controls (C = 9.22 ± 1.8 MJ/d) though athletes exhibited significant higher total EE (p < 0.05). Retired athletes showed lowest EI (6.49 ± 1.5 MJ/d) resulting in a conspicuously higher energy deficit (−3.47 ± 1.6 MJ/d) compared to athletes (−1.78 ± 3.3 MJ/d) and controls (−0.22 ± 1.9 MJ/d). Negative energy balance was not associated with EE during training (r² = 0.27). Frequent dieting or restricted eating was reported by 50% of controls, 43% of active and 63% of retired athletes respectively. Negative energy balance shown in athletes was accompanied by inadequate intakes of both vitamin D and calcium.

Discussion: Restricted eating was common among female adolescents. Data suggest that not only competitive athletes, but particularly females having abandoned from competitive career to be a population at risk for developing eating disorders.

Conclusion: Young female athletes seem to be vulnerable for developing unhealthy eating patterns in order to maintain weight. Establishing screening tools in special athletic schools or colleges to detect females at early stages of disordered eating and to prevent symptoms of female athlete triad would be desirable.

Determinants of the functional status in institutionalized female elderly

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Introduction: It is well known that body composition and skeletal muscle strength change through aging, resulting in a declined functional performance. This study aimed at determining the relationship between the functional status, age, body composition and muscle strength in institutionalized female elderly.

Methods: One hundred and ninety-three women older than 70 years of age were recruited from nursing homes, service-flats and convents. After medical screening, 112 women were included in the study. One participant was excluded from the statistical analyses because of extreme obesity. Functional measures of upper and lower extremity strength, range of motion, balance and gait were evaluated on a 36-point modified physical performance test (mPPT). Body weight and height were measured and body mass index (kg/m²) was calculated. Muscle strength
was measured using an isokinetic dynamometer (Biodex®) and lean body mass was determined using dual energy X-ray absorptiometry (Hologic®).

**Results:** 56.5 % of the total score on mPPT was predicted by peak velocity developed by the quadriceps muscle in unloaded knee extension (Vel, β = 0.40), maximal isometric strength of the quadriceps muscle corrected for body mass (Fiso, β = 0.30), AGE (β = −0.25) and body mass index (BMI, kg/m², β = −0.16). The multiple regression equation: mPPT = 37.07 + 0.027 Vel + 2.43 Fiso − 0.20 AGE − 0.18 BMI.

**Discussion:** The functional status of female elderly is determined by peak velocity of muscle contraction, maximal isometric strength, age, and body mass index. Peak velocity and maximal isometric strength of the quadriceps muscle determined 50% of the variance in functional status. Lean body mass was highly correlated with BMI and did not add any new information to the equation.

**Conclusion:** Because a decline in functional performance is highly predictive of disability and falls, future studies should evaluate the effects of specific training designed to improve muscle strength and velocity of muscle contraction.

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**Gender differences in force-power-velocity relationships**

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**Introduction:** The aim of the study was to investigate gender differences in force-power-velocity relationships during an inertial bench press assessment.

**Methods:** Seventeen women and 20 men voluntarily participated to the study. The protocol consisted in an inertial muscular profile bench press assessment. During the first session, after a familiarization period, testing position was determined and maximal strength (1RM) was assessed. A week later, velocity, power and force performances were assessed at four increasing loads (30–35% ; 50% ; 70% and 95% of the 1RM) in order to determine the muscular profile. Bench press exercise was performed on a Smith Machine which was modified in order to allow women assessment at the lightest loads (30% of the 1RM).

**Results:** Women maximal strength corresponded to 44.6% of the men 1RM (29 ± 5 kg vs. 65 ± 11 kg). The gender difference at maximal power reached 64.5% (761w for men and 270w for women). When measured at the same relative load, velocity performances were quite similar: differences never exceeded 10%.

**Discussion:** In agreement with literature, our study demonstrated pronounced differences between men and women with regard to maximal strength and power performances. These results resulted from differences in muscle mass and cross sectional area. In contrast, muscular velocity seemed not to be gender dependent. The lower velocity performance observed in women group was mainly attributed to a shorter range of motion (shorter arms) and not to muscular typology differences.

**Conclusion:** There are considerable gender differences in force-power-velocity; it can mainly be attributed to the differences in muscle mass and segment size, but probably not in muscle typology.

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**Motor ability dimensions in frail elderly**

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There are many tests assessing motor and functional abilities in frail elderly people. The aim of this study was to reduce the number of such tests and maintain information about their motor performance. Ninety-three people
(30 men, 63 women), aged between 60 and 96 (80 ± 8 years) were recruited. We measured maximal isometric strength of trunk and leg muscles, flexibility of trunk, head, shoulder and flexibility of back and hamstrings as well. Static balance was measured in two different conditions and total score of Berg balance scale (functional tasks) was used. Exploratory factor analysis was carried out, the method of extraction was Principal Component Analysis with oblique rotation (promax). From 17 variables measured, a four-factor model including “strength”, “flexibility 1”, “flexibility 2” and “balance” emerged which accounted for 74.4% of the total variance (TV). All strength variables loaded high on the first factor “strength” (42.1% TV). Measures of flexibility were surprisingly divided in two factors, one representing flexibility of the trunk and head (14.6% TV) and another of the shoulder (10.2% TV), while flexibility of the back and hamstrings loaded on both factors. Two variables of static balance represented the “balance” factor (7.4% TV), while Berg balance scale loaded high on factors “strength” and “balance” which showed a complexity of the test. Reduced test battery emerging from the model included four tests with the highest loading on single factor (torque of the trunk adduction to the left, flexibility of the trunk rotation to the left, flexibility of shoulders with back scratch and stance on force plate with feet together) and one additional complex test (Berg balance scale). The reduced battery of 5 motor performance measures out of 17 could be used to assess the motor ability in elderly people living in institutions.

Physical exercises – important factor for metabolic syndrome treatment

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Introduction: The metabolic syndrome (MS) is emerging as one of the major medical and public health problems in worldwide. Today, is generally recognized that the physical inactivity is the second major cause of the metabolic syndrome after obesity. Starting from these aspects, the purpose of our study was to assess physical exercises effects on MS.

Methods: The study, that has included 35 subjects with MS diagnostic, 15 men and 20 women, mean age 48 ± 2 years, was developed during six months. MS was defined with the presence of at least three of the following factors: waist circumference >88 cm (women), >102 cm (men); fasting glucose 6.1 mmol/l; systolic blood pressure 130 mmHg, diastolic blood pressure 85 mmHg; triglycerides 1.7 mmol/l; HDL cholesterol <1.3 mmol/l in women, <1.04 mmol/l in men. Before start study and at the end of the study, the subjects were evaluated by clinical examination, aerobic capacity and biochemical testing. The subjects were randomly divided into two groups: a study group and a control group. During the research, at the study control we applied a rehabilitation programme compose only dietetically and pharmacological measures and at study group we applied supplementary aerobic physical exercises (40–60 min, 40–60% VO2max intensity, 3times/week), resistance and flexibility exercise (50–75% of 1-RM resistance intensity, 2times/week, alternative with aerobic days exercises).

Results and conclusions: After six months of rehabilitation program the results evaluations of both groups was improved, but the study group had statistical significant dates. Also, the criteria’s for MS diagnostic was presented at only 67% of study group subjects by comparison 82% at control group.

In conclusion, our research demonstrated an inverse relationship between regular physical activity and the different manifestations of MS, like waist circumference, fasting glucose, blood pressure, triglycerides and HDL cholesterol. The association between dietetically and pharmacological measures with physical exercises represent the ideal formula for MS prevention and treatment.
Influence of eccentric training on maximum force capacity of the lower extremity in patients with Achilles tendinopathy

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Introduction: Maximum force capacity (MFC) can be altered in patients with Achilles tendinopathy (AT) (Silbernagel 2006). In addition to physiotherapy, eccentric muscle training involving the whole lower limb may reduce clinical symptoms (Shalabi 2004). The benefit on lower extremity strength capacity remains unclear. The objective of the study was to evaluate effects of eccentric training on total strength capacity of the lower limb in AT patients.

Methods: 23 runners with chronic unilateral AT were randomized to either a physiotherapy group (PT)(deep-friction, ice, ultrasound) or an eccentric training group (ET)(physiotherapy + eccentric exercises). Intervention period was 12 weeks. MFC of the injured extremity was evaluated during leg extension (5 repetitions, concentrically and eccentrically at 0.5 m/s) pre (M1) and post (M2) intervention (Con-trex LP\textsuperscript{®}). Descriptive statistics was followed by repeated measures ANOVA (α = 0.05).

Results: Considering descriptive analysis maximum strength increased in both groups. Concentric (ET: +8%, PT: +10%) and eccentric MFC (ET: +13%; PT: +4%) showed no statistically significant differences between groups (p > 0.05) (Table 1).

<table>
<thead>
<tr>
<th>Group</th>
<th>M1 ± SD</th>
<th>M2 ± SD</th>
<th>M1 ± SD</th>
<th>M2 ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET</td>
<td>1365 ± 138</td>
<td>1478 ± 135</td>
<td>1089 ± 72</td>
<td>1155 ± 75</td>
</tr>
<tr>
<td>PT</td>
<td>1490 ± 159</td>
<td>1538 ± 156</td>
<td>1025 ± 79</td>
<td>1125 ± 85</td>
</tr>
</tbody>
</table>

Discussion: Both treatments lead to a slightly improved MFC of the lower limb. These alterations in maximum strength might be due to a reduction of pain throughout the intervention phase (Herrington 2007). The study suggests that eccentric training in combination with physiotherapy seems not to have substantial effects on MFC of the lower extremity.

Conclusion: Despite a well known pain reduction due to eccentric training in AT patients, there is no superior effect on MFC of the lower limb compared to isolated physiotherapy treatment.

References

Myoelectric activity of the shoulder muscles during ‘in-vivo-drive’

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Introduction: This empirical study was undertaken with the objective of finding out how high the actual myoelectric and mechanical strain of the muscles of the shoulder is during an ‘in-vivo’ drive in an automobile in relation to their maximum power. Previous studies using a virtual setting has shown significant differences between shoulder and neck muscles activity as well as differences right to left side muscle activities. The following findings could be important for the physically modelling(tension calibration) of an vivo-equivalent test dummy to understand the morphological and biomechanical behavior of a whiplash injury caused by car driving or in understanding the load in a car race.

Method: In using bipolar surface-Electromyography (EMG) on a healthy and voluntary test person, both the myoelectric activity during maximal voluntary contraction (MVC) and the mechanically produced power of the M. Trapezius pars descendens were simultaneously recorded.

Results: The left M. Trapezius p. desc. amounts to 6.23% of the maximal voluntary contraction on average; the right M. Trapezius p. desc. amounts to 2.42% of the maximal voluntary contraction on average. Overall, the strain of the left M. Trapezius p. desc. is 50.97% higher on average than that of the right M. Trapezius p. desc. The strain of the M. Trapezius p. desc. amounts to up to 25% of the maximal voluntary contraction in isolated situations.

Discussion / Conclusion: The strain of the M. Trapezius while driving a car is to be considered high at a rate of up to 25% of the maximal voluntary contraction. These findings are relevant for prevention in the field of conditions using technical assistance as well as in the field of behavior prevention. Nevertheless these findings were used in the setting of a vivo-equivalent (crash and race-car) test dummy for understanding the load in a car race.

A meta-analysis to determine the training frequency in strength training

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Introduction: Resistance training frequency is one of the main training factors in competitive and non-competitive sports as well as in evidence-based medicine[2]. Training frequency is defined as the number of workouts within one microcycle. Typical recommendations are two or three total body workouts per week for beginners, between two and four training sessions for intermediate trainees and as many as 18 training sessions for top athletes.

Methods: A meta-analysis was performed to determine the effect sizes (ES) of training interventions. 2198 subjects were examined with a total of 118 effect sizes at 1-RM. Results: The results of the meta-analysis show generally, that two (1.18 ± 0.68 ES), three (1.42 ± 0.76 ES), and four (1.85 ± 1.94 ES) weekly training sessions are better to increase 1-RM than one (0.43 ± 0.30 ES), five (0.41 ± 0.29 ES) or six (0.36 ± 0.04 ES) training sessions ($F = 3.96; \text{df} = 5; p < 0.05$). Furthermore, the effect size of training frequency is influenced by variables such as sex, training experience, training method and periodization of training.

Discussion: For advanced and trained subjects, two training sessions per week are sufficient, whereas for beginners and untrained subjects three training sessions are suggested. Rhea et al. conclude that trained subjects are able to train more intensely and therefore need more time for recuperation between workouts [3]. Training interventions with periodized intensity as well as volume have additional effects for increasing 1-RM [1].

Conclusion: The relationships of cost/benefit and effort/benefit show that for most athletes, three training sessions per week is the best choice to increase the 1-RM.
Drop-landings represent a functional task for athletes in rehabilitation. To find characteristics in the force-time-curves in drop-landings related to injuries, reference data must be available. Unfortunately, no data exist concerning vertical ground reaction forces (VGRFs) during drop-landing. Therefore the purpose of the study was to evaluate the reliability of VGRF in a drop-landing series to have a basis for collecting a reference data pool. Eight male volunteers executed 40 drop-landings barefooted from a height of 25 cm. The ground was contacted as soft as possible simultaneously with both feet. VGRF was measured for each foot separately. For the peak and valley of the force-time-curves the time points (tpeak, tvalley) and forces (Fpeak, Fvalley) were analysed. The test series was split in four sessions (M1-M4) each consisting of ten drop-landings. The coefficients of variation (CV) of both parameters were compared using ANOVA with repeated measures. The mean CV for tpeak was 5.5% (SD 1.0%) while it was 15.90% (SD 3.4%) for Fpeak. The variability of tvalley was higher with 10.1% (SD 3.2%) as well as 19.8% (SD 1.6) for Fvalley. The highest CVs of all parameters were consistently in M1. Statistical analysis revealed a significant difference of CV for tpeak of the left leg between M1 and M2 ($p = 0.02$) and between M1 and M3 ($p = 0.02$). No further differences could be detected. Force plates deliver reliable parameters of VGRFs in a drop-landing series related to tpeak and tvalley. The significant differences in these parameters at the left leg between the initial session and the two following sessions were discussed as a familiarization effect. Time characteristics during drop-landings could be a basis for reference values, but future studies should also focus on other force parameters, the influence of gender and the instruction of the task to prepare the ground for a reference data pool.

Study regarding electromyographic biofeedback efficiency in rehabilitation after anterior cruciate ligament reconstruction

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Introduction: After an ACL (anterior cruciate ligament) injury, especially at young active persons, treatment includes surgery to rebuild the torn ligament, followed by an intense rehabilitation program to regain the muscular force, knee range of motion and neuro-motor coordination.

Methods: The study was made on 84 patients after ACL reconstruction. The electromyographic biofeedback has been associated to a classical protocol of rehabilitation, consisting of physiotherapy and physical therapy, on a study group of 35 patients. The efficiency of this method was evaluated by comparing its results with those from a control group of 39 patients who benefited only from classical rehabilitation methods. An electromyographic biofeedback and electrical stimulation device - Myomed 134 was used by applying 11 therapeutical protocols (Table 1).


**1 month postoperative**

![Graph showing ADL, SP, QOL, AF, QF, PD parameters](image)

**3 months postoperative**

![Graph showing ADL, SP, QOL, AF, QF, PD parameters](image)

**6 months postoperative**

![Graph showing ADL, SP, QOL, AF, QF, PD parameters](image)

**12 months postoperative**

![Graph showing ADL, SP, QOL, AF, QF, PD parameters](image)

Fig. 1. Evolution of monitored parameters Study group Control group.

Table 1

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Therapy</th>
<th>Submenu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EMG biofeedback</td>
<td>Isometric contraction 5” / Rest 5”</td>
</tr>
<tr>
<td>2</td>
<td>EMG biofeedback</td>
<td>Isometric contraction 7” / Rest 5”</td>
</tr>
<tr>
<td>3</td>
<td>EMG biofeedback</td>
<td>Isometric contraction 10” / Rest 5”</td>
</tr>
<tr>
<td>4</td>
<td>EMG biofeedback</td>
<td>Template</td>
</tr>
<tr>
<td>5</td>
<td>EMG biofeedback</td>
<td>Continuous isometric contraction</td>
</tr>
<tr>
<td>6</td>
<td>EMG biofeedback</td>
<td>Isometric contraction 5” / Rest 5” on 2 channels</td>
</tr>
<tr>
<td>7</td>
<td>EMG biofeedback</td>
<td>Template on 2 channels</td>
</tr>
<tr>
<td>8</td>
<td>EMG biofeedback and electrical stimulation</td>
<td>Rest 5” / isometric contraction 5” / electrical stimulation</td>
</tr>
<tr>
<td>9</td>
<td>EMG biofeedback and electrical stimulation</td>
<td>Rest 5” / isometric contraction 5” / electrical stimulation on 2 channels</td>
</tr>
<tr>
<td>10</td>
<td>EMG biofeedback and electrical stimulation</td>
<td>Stimulation under the lower threshold value</td>
</tr>
<tr>
<td>11</td>
<td>EMG biofeedback and electrical stimulation</td>
<td>Stimulation over the lower threshold value</td>
</tr>
</tbody>
</table>

**Results:** The followings were monitored monthly, for one year: the knee’s active range of motion for flexion, the strength of quadriceps femori muscle, the electrical potentials of this muscle in work and rest and KOOS scale. The result are presented in Table 2 and in Figs 1-3.

**Discussions:** The assignment of biofeedback EMG to the rehabilitation program has significantly changed, in all the rehabilitation phases, the recovery of the muscular force in direct and strong correlation (Pearson coefficient \( r = 0.87 \)) with muscular electrical potentials as compared to classical rehabilitation (\( p < 0.05 \)) and considerably
Table 2
Results for the monitorized parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Study Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
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<tr>
<td><strong>EMG parameters</strong></td>
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<tr>
<td>Work average potential ($\mu$V)</td>
<td>25.92 ± 5.63</td>
<td>95.64 ± 4.38</td>
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<tr>
<td>Rest average potential ($\mu$V)</td>
<td>16.31 ± 4.56</td>
<td>5.23 ± 3.91</td>
</tr>
<tr>
<td><strong>Muscular force of quadriceps femoris</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual testing</td>
<td>3.29 ± 0.12</td>
<td>4.83 ± 0.14</td>
</tr>
<tr>
<td><strong>KOOS scale</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P (pain)</td>
<td>34.45 ± 2.36</td>
<td>91.23 ± 4.21</td>
</tr>
<tr>
<td>S (other symptoms)</td>
<td>39.62 ± 3.11</td>
<td>92.72 ± 4.51</td>
</tr>
<tr>
<td>ADL (activities of daily living)</td>
<td>41.42 ± 5.21</td>
<td>96.31 ± 3.52</td>
</tr>
<tr>
<td>SP (sport and recreational activities)</td>
<td>25.87 ± 6.11</td>
<td>96.87 ± 2.48</td>
</tr>
<tr>
<td>QOL (quality of life)</td>
<td>39.31 ± 3.27</td>
<td>96.54 ± 3.07</td>
</tr>
</tbody>
</table>

changed both the capability to perform sport and recreation activities (at 3 and 6 months from the beginning of the rehabilitation, \( p < 0.05 \)) and the recovery of the knee range of motion.

**Conclusions:** The advantages of this method are: its objectivity and possibility of application in any rehabilitation phase, the quantified progressivity; the surface electromyography becomes the patient’s immediate response to the recovery program and used under the form of electromyographic biofeedback, significantly improves the knee monitored parameters immediately and in the long term, even if the EMG biofeedback had been applied only in the first 2 postoperative months.

**References**

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Pre eccentric</th>
<th>Pre concentric</th>
<th>Post eccentric</th>
<th>Post concentric</th>
<th>VISA-A</th>
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<tbody>
<tr>
<td></td>
<td>M1 ± SD</td>
<td>M2 ± SD</td>
<td>M1 - M2 %</td>
<td>M2 - M1 %</td>
<td>M2 - M1 %</td>
</tr>
<tr>
<td>ET</td>
<td>91.0 ± 11.5</td>
<td>101.0 ± 10.4</td>
<td>+18.2</td>
<td>63.2 ± 5.3</td>
<td>+21.2</td>
</tr>
<tr>
<td></td>
<td>109.6 ± 10.5</td>
<td>118.0 ± 9.4</td>
<td>+13.7</td>
<td>73.1 ± 6.5</td>
<td>+18.5</td>
</tr>
</tbody>
</table>

Pain reduction and peak torque in plantarflexion after eccentric training in patients with achilles tendinopathy

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**Introduction:** Eccentric training can alleviate pain in patients with Achilles tendinopathy (AT) [2]. It remains open if this is accompanied by an enhanced maximum strength capacity (MSC). The purpose of the study was therefore to analyze the effects of a 12-week eccentric training on MSC of the plantar flexion in patients with chronic AT.

**Methods:** 26 patients with unilateral chronic AT were randomized to an eccentric training (ET) and a control (PT) group. All subjects received physiotherapy (deep-friction, ice, ultrasound) for 12 weeks. ET additionally performed a progressive eccentric training regimen. Plantar flexion peak torque of the injured side was tested pre (M1) and post (M2) intervention on a dynamometer at 60°/s (Con-trex®-MJ). Multivariate data analysis (ANOV A, α = 0.05) was carried out. Additionally subjective pain (VISA-A) was assessed.

**Results:** Peak torque increased by 18.2% (eccentrically) and 21.2% (concentrically) in ET, whereas PT increased by 13.7% and 18.5% (Table 1, p > 0.05). Subjective pain decreased in both groups. VISA-A-score improved by 27% (ET) and 21% (PT) (p > 0.05).

**Discussion:** Both groups improved in MSC. ET did not result in a statistically significant higher response than PT. Pain reduction might therefore be a valid explanation model for increased strength capacity. In contrast to Herrington [1], no relevant benefit of an additional eccentric training compared to physiotherapy treatment alone was found considering the VISA-A-score.

**Conclusion:** Both therapy approaches can reduce symptoms in patients with chronic AT. The outcome of eccentric training in addition to physiotherapy is equivalent to physiotherapy alone. Peak torque improvements due to eccentric training are not substantial.

**References**


Algorithm of prevention and rehabilitation in iliotibial fasciitis of runners

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**Introduction:** Iliotibial fasciitis is a result of repeat knee movement flexion.

**Objective:** This study presents a protocol of prevent and rehabilitation of knee stability and functionality using physical exercises.
Material and method: Study including 20 patients, runners, mean age 20 years. Assessment of subjects: clinical, functional assessment, muscle-joint testing, specific tests-Ely, Schlesinger, Renne, Noble, Thomas. Assessments have been included scales for approach global status of knee, using D’Aubigne scale, Marshall and Gym. Goals of prevention and rehabilitation programme: restore flexibility, alignment, stability of knee, improvement of muscle control and balance. We recommended physical exercises like adduction and extension of knee, lateral deviations, Kabat method for lower limb, isometric iliotibial stretching at knee flexion 90°, maintain 20–30 seconds, 3–5 repetitions; muscle tonify has been included in our protocol.

Results: Global assessment showed that exits an improvement of functional knee status. Renne test was positive at 80% patients, after protocol, at 5 weeks was positive at 20% patients, at 6 weeks 2% patients; Nobel test was positive before protocol at 90% patients, at 4 weeks positive to 40% patients if the knee flexion is more then 300, and positive to 10% after 6 weeks. Thomas test showed 50% flexibility before, at 20% patients and after 6 weeks flexibility was 85% from normal status at 90% patients and 75% from normal at 10% patients. Conclusions: Assessment scales and specific tests help us to create a good prevention and rehabilitation programme; a complete rehabilitation programme include all types of stretching and physical exercises for improvement knee functionality. Also physical exercises or increase muscle force must to be alternate to stretching muscle. We observed that is a good clinic evolution of our patients and the results of our study can help the runners, the doctors and the physical therapist to prevent recurrence and to improve knee functionality.

Assessment, and proprioceptive rehabilitation programme in infraspinatus syndrome at athletes

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Introduction: Infraspinatus syndrome is between neurological and traumatic injuries of shoulder. Objective: We propose an assessment protocol and rehabilitation algorithm in infraspinatus syndrome, including proprioceptive tests and training.

Material and method: 20 subjects, 22 years, volleyball players. All had shoulder pain.
Assessment: physical functional, specific (Neer, Hawkin, Drop arm sign, Tensiomiography).
Treatment: decrease pain, increase scapular stabilization, rotator cuff muscle tonus. Passive movements for normalize internal rotation, resistive training for weakness. Proprioceptive exercises maintain shoulder mobility, prevention of musculotendinous retraction; promote scapular/shoulder stabilization, increase motor/muscle control, coordination. We used closed kinetic exercises. For muscle force and balance we used progressive weight exercises started slow, controlled movements and isometrics, progressing to more eccentric contractions and finally to higher speed activities. At the beginning 500 g, 8–10 x 3 sets, with control of pain. At the end plyometric exercises programme.

Results: Increase flexibility, from 20% to 45%, increase of muscle force at shoulder, Neer test positive to 90% after treatment, only at 10% patients, Hawkin test positive, before at 85% and at 5% after. Drop arm test positive to all and after this percent was 10% patients. Decrease of pain from 100% before to 5% after treatment. Using tensiomiographic assessment we observed an increase of lateral symmetry from 40% to 60% (normal 80%) and agonist/synergist harmonization increase from 20% to 50% (normal 65%) after 3 week treatment.

Conclusions: Is important a complex assessment of shoulder before rehabilitation programme and drive the proprioceptive training based on neuromuscular assessment like tensiomiography. Specific assessment helps to observe the dynamic evolution in infraspinatus syndrome. Our earlier rehabilitation protocol can involve reducing the risk of recurrence. The prognosis for a favourable clinical outcome is good. The athletes can perform sport-specific skills in a pain-free manner, they can return to play. Practical study has been made to volley team of University of Craiova.
**Peak torque in rotational shoulder movements in patients with supraspinatus tendinopathy**

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**Introduction:** Supraspinatus tendinopathy (SSPT) is one of the most frequent overuse injuries in overhead sports. However, the influence of SSPT on maximum strength capacity (MSC) in rotational shoulder movements is not clear. Possible deficits of MSC could give implications for non-surgical treatment strategies. The purpose of the study was therefore to examine MSC of rotational shoulder movements in patients suffering from SSPT.

**Methods:** Peak torque [Nm] in shoulder internal (IR) and external rotation (ER) were measured (Con-trex® Multi Joint System) in 24 athletes (overhead sports; age: 31.6 ± 8.5 years, height: 177.9 ± 11.5 cm, weight: 77.9 ± 16.1 kg) with unilateral (dominant-sided: 21, non-dominant-sided: 5) SSPT. Tests (supine position, 90° abduction) included isometric and isokinetic ballistic (concentric [CON], eccentric [ECC]) work modes at 60°/s [1]. Peak torque of the injured side was individually compared with the non-injured shoulder (mean, 95%-confidence interval [CI]).

**Results:** Peak torque values for IR showed no side differences, whereas peak torque in ER was reduced in the injured side (9–12%, Table 1).

<table>
<thead>
<tr>
<th>Level</th>
<th>Mean [Nm]</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>Mean-Difference [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER0°Iso-healthy</td>
<td>41.6</td>
<td>34.4</td>
<td>48.8</td>
<td>12.4</td>
</tr>
<tr>
<td>ER0°Iso-injured</td>
<td>37.0</td>
<td>29.8</td>
<td>44.2</td>
<td></td>
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<tr>
<td>ER60°Ecc-healthy</td>
<td>38.1</td>
<td>30.9</td>
<td>45.2</td>
<td>11.9</td>
</tr>
<tr>
<td>ER60°Ecc-injured</td>
<td>34.0</td>
<td>26.8</td>
<td>41.2</td>
<td></td>
</tr>
<tr>
<td>ER60°Con-healthy</td>
<td>30.8</td>
<td>23.6</td>
<td>38.0</td>
<td></td>
</tr>
<tr>
<td>ER60°Con-injured</td>
<td>28.2</td>
<td>21.0</td>
<td>35.4</td>
<td>9.2</td>
</tr>
</tbody>
</table>

**Discussion:** Reports show higher MSC on the dominant side in overhead athletes [2]. Side-differences between dominant and non-dominant shoulder strength may interfere with possible strength reductions due to SSPT.

**Conclusion:** The results imply that MSC of ER may be reduced by SSPT. Functional strengthening exercises of shoulder external rotators might therefore be a valid goal of rehabilitation.

**References**


**The conservator treatment to prevent surgery intervention in shoulder impingement syndrome**

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**Introduction:** The shoulder impingement syndrome is common at athletes involved in sports where the shoulder performs repetitive overhead movements: tennis, volleyball, swimming, throwing. This main objective of this study...
was to observe the evolution of shoulder impingement syndrome (SIS) at athletes after the conservator treatment for stop the evolution and to prevent surgery intervention.

Methods: The study has included 16 patients (throwing athletes, male sex, age = 24 ± 1.5 years; weight = 95 ± 8.4 kg; height = 1.87 ± 5.4 m) with SIS, which were randomly divided into two lots, each with 8 subjects. We evaluated the subjects, before and after conservator program, using clinical pain assessment scale 0–16, specific tests for SIS, like Hawkin test and Empty test, evaluation of active range of motion (goniometry) and passive range motion. The treatment for Lot1 was: joint mobilization, comprehensive treatment stretching of rotator cuff and arm muscles with isometric stretching and hold relax techniques, soft tissue mobilization and dynamic orthosis. Each day included all the techniques that we presented before. Isometric stretching during 3 sets ×8 rep, stretching 50 sec with 20 sec rest. Lot2: comprehensive treatment. The subjects were evaluated before and after 10 days of treatment.

Results: Score of pain – Lot1: before, 12 at 62.5% and 14 at 37.5% / after, 2 at 87.5% and 3 at 12.5%; Lot2: before, 12 at 50% and 13 at 50% / after, 4 at 75% and 2 at 25%; Hawkin test – Lot1: before, + at 100%, after, + at 37.5%; Lot 2: before, + at 100% / after, + at 62.5%; Empty test – Lot1: before, + at 87.5% / after, + at 25%; Lot 2: before + at 100% / after, + at 50%. The Lot1 improved all variables, while the Lot2 improved only mobility and function.

Conclusions: In SIS initial treatment is nonsurgical. In accord with the results of our research we recommend conservator treatment, respectively: joint mobilization, isometric stretching, hold relax techniques, soft tissue mobilization and dynamic orthosis, for prevent surgery intervention at athletes with SIS.