EFFECTS OF FREE WEIGHT AND HYDRAULIC RESISTANCE TRAINING EVALUATED BY FREE WEIGHT AND HYDRAULIC AND ISOSTICK TESTS.

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Three testing modes were used, twice during and post training to compare the effects of training with free weights (N=16) and hydraulic resistance exercise (N=12). Training included 4 to 6 sets of 3 to 6 reps of supine bench press (BP) and upright squat (SQ) x 3 wk±13 yrs. A control group did not train (N=10). Testing included 1-REP maximum without a warm-up using a bench for BP and SQ, peak force and rep power for BP assessed on an Omnitec Dynamometer (Hydra-Fitness, Bellon, TN), and isokinetic peak force and peak power for BP and SQ at 5°/sec (Arioli 2000, Trabuco Canyon, CA). Repeated measures ANOVA showed increases in all variables and no between-group differences (p<0.05). Significant interactions were found for modes, free weight BP and SQ, and isokinetic/hydraulic force and power (p<0.05). No changes occurred for the control group (p>0.05). Pre to post test changes were:

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<tr>
<th>Mode</th>
<th>Free Weight</th>
<th>Hydraulic Test</th>
<th>Group</th>
<th>D1</th>
<th>D2</th>
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<th>D10</th>
<th>D11</th>
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<tbody>
<tr>
<td></td>
<td>Free Weight</td>
<td>Hydraulic Test</td>
<td>Group</td>
<td>D1</td>
<td>D2</td>
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<td>D4</td>
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<td>D9</td>
<td>D10</td>
<td>D11</td>
<td>D12</td>
<td>D13</td>
</tr>
<tr>
<td>Free Weight</td>
<td>36% 17% 9% 24% 9% 25% 7% 19%</td>
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<tr>
<td>Hydraulic</td>
<td>38% 10% 12% 28% 6% 12% 9% 15%</td>
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</table>

The results demonstrate that 13 weeks of free weight and hydraulic resistance training does not produce similar changes in maximum force and peak power, and that performance improvements occur independent of training mode.

Supported in part by a grant from Hydra-Fitness Industries.

MUSCLE ENHANCING AND HISTOCHEMICAL CHARACTERISTICS.

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Previous studies suggested that combined strength and endurance training (ConeTr) improves the rate of performance adaptations, compared with the adaptation rate to a single training method. This study evaluated ConeTr effects on muscle enzyme activities, fiber area and capillarization. Subjects were divided into 2 groups. Cone-Tr strength-trained one leg and did ConeTr with the other leg; E-Comb endurance-trained one leg and did ConeTr with the other leg. Strength training was unilateral leg presses, 6 sets, 15 REP. Endurance training was 5-3 min bouts of unilateral cycle exercise at 90-100% VO2max. The vastus lateralis of each leg was biopsied before and after training 3 times weekly for 20 weeks. CS, PK, and/or LDH activities increased by up to 50% (p<0.01). Mean fiber area increased by 17% in both legs of E-Comb, but no change was observed in either leg of E-Comb. Inter-leg comparisons of enzymatic, fiber area and capillary density changes did not support the hypothesis that ConeTr impairs callous adaptations normally associated with engaging in a single type of training.

INVESTIGATION OF EXERCISE EFFECT OVERFLOW FROM SPEED-SPECIFIC ISOKINETIC ACTIVITY.

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The concept of physiological overflow during speed-specific isokinetic exercise was tested on 30 volunteers, 14 female, 16 male; mean age 24.3 yrs; age range 17-29 yrs, who were subjected to a repeated measures experimental design. Testing involved 3 repetitions of knee extension/flexion at the velocity spectrum speeds of 60, 120, 180, 240 and 300 deg/sec preceded by a warm-up of 3 gradient submaximal repetitions and 1 maximal effort at each speed. The experimental treatment consisted of isokinetic exercise of the knee musculature to the level of 502 quadriceps fatigue at the speed of 180 deg/sec in a form of 3 sessions per week for a period of 8 weeks. ANOVA testing (p<0.01) with repeated measures revealed statistically significant differences in quadriceps and hamstrings activities, indicating that the knee extensors and flexors do not appear to be equally used over the period of experimentation. The concept was confirmed that a 120 deg/sec isokinetic overflow of exercise effects to both slower and faster speeds existed during the program of isokinetic activity. This information would be important for the clinical design of rehabilitation programs.

SPECIFICITY OF ISOKINETIC TRAINING ON QUADRICEPS AND HAMSTRING PEAK TORQUE, TORQUE ACCELERATION ENERGY, POWER, AND WORK IN INTERCOLLEGIAL LACROSSE PLAYERS.


The effect of high speed isokinetic training on peak torque (PT) has been documented. Lesser attention has been given to changes in torque acceleration energy (TAE), average power (AP), and total work (TW) with high speed isokinetic training. The present study examined the effect of high speed isokinetic training on knee extension (KE) and knee flexion (KF) PT, TAE, AP, and TW in intercollegiate lacrosse players (N=4 experimental, E; control C), randomly assigned; 5 age±2 yrs; height±2cm; body weight±10 kg.) Training of right and left KE and KF consisted of 3 sets of 25 repetitions at 270/4, 3 days per week for 7 weeks on an isokinetic dynamometer. Subjects were pre- and post-tested for right and left KE and KF at 60, 120, 180 and 270°/sec, and TAE, AP, and TW at 270°/sec with a Cybex isokinetic dynamometer. Analysis of variance revealed a significant training effect for KE PT (p<0.05) KE at 60°/sec. KE at 270°/sec and KF (p<0.05). KE at 60°/sec, KE at 270°/sec and TW at 270°/sec. No significant differences were observed for KE or KF at 60 or 180°/sec. Significant differences were only achieved for KE and KF at 270°/sec. The training resulted in high speed isokinetic training were associated with increases in TAE and AP. It was further concluded that increases in PT were specific to training velocity.

EQUIVALENT CHANGES IN VO2 MAX AND PERCENT BODY FAT SUBSEQUENT TO MUSCLE AND ENDURANCE TRAINING.

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Forty male subjects, ranked in order of their relative VO2 max values, were assigned to one of the following four groups by the technique of stratified randomization so as to equalize their initial fitness levels: (1) control group, (2) continuous training group one, (3) continuous training group two, (4) interval training group, IIG. The training intensities were regulated as follows: (1) - 10% above the first ventilatory threshold (power output at which VO2/VO2max reaches a minimum); (2) - between the first ventilatory threshold and VO2 max; IIG - 100% VO2 max with rest intervals of one minute each. Training power output was measured for the three training groups during the eight week program. After 24 training sessions, all three training groups showed similar increases in VO2 max (p<0.01) and similar decreases in percent body fat (p<0.05). The groups did not show any changes during this period. The hypothesis that the different intensities and methods of training will induce equivalent changes in VO2 max but differential changes in percent body fat provided the total amount of work accomplished was equated was not substantiated. It appears that short term interval training is as effective as continuous training in eliciting changes not only in VO2 max but also in percent body fat.

DIFFERENTIAL CHANGES IN LEG FUNCTION CONSEQUENT TO LOW, MODERATE, AND HIGH REPETITION WEIGHT TRAINING.

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The functional effects of three weight training programs were compared in 38 untrained men. Dependent variables were isokinetic quadriceps and hamstrings activity, knee extensor/flexor peak torque at both 60°/sec and 300°/sec, and vertical jump. After pretesting, subjects were randomly assigned to one of three exercise groups or to a sedentary control group. For 7 weeks, 3 days per week, each exercise group completed one of the following training routines: Group I, 4 x 3 - 5 repetitions maximum (RM); Group II, 4 x 13 - 15RM; Group III, 23 - 25RM. Group IV remained inactive. Squat strength increased significantly in Group II and Group III as compared to the control, while Group I also increased significantly more (p<0.05) in the squat than Group III. Knee extension peak torque at 60°/sec increased significantly (p<0.01) in all three exercise groups when compared to the control. No significant differences (p>0.05) were found between the groups for changes in any of the other dependent variables. These results indicate that short-term squat strength training programs do little to enhance functional abilities of the legs as measured in this study except for squat strength and slow-speed isokinetic peak force.