878 Board #4 May 27 1:30 PM - 3:00 PM

Variation Of Resistance Exercise Intensity Versus Resistance Exercise Selection: The Effects On Strength And Power

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(No relationships reported)

PURPOSE: To compare the effects of exercise selection variations versus exercise intensity variations on absolute strength and power measures across a 4-week training block for in-season collegiate athletes.
METHODS: 14 Division II collegiate track and field athletes (n = 5 females; n = 9 males; age: 20.7 ± 1.4 yrs; primarily anaerobic based track and field events) participated in one of two 4 week periodized exercise programs: 1) manipulation of resistance training intensity (INT group), 2) manipulation of resistance training exercise selection (EXE group). Exercise selection was held constant in the INT group while the intensity was varied (85%-90%). The EXE group held intensity at a constant but varied the selection of exercises (e.g. pin squat, box squat). The mean intensity and working repetitions across the 4-week block of training were equated across the groups. Absolute strength was assessed with a 1-repetition maximum (1RM) back squat and power was assessed in a vertical jump.
RESULTS: Both INT (mean improvement: 3.52 kg, p<0.05) and EXE (mean improvement: 3.08 kg, p<0.05) increased 1RM across the training period, but there were no significant differences between the groups (p>0.05). Both groups produced an increase in jump height (INT mean improvement: 0.04 m, p<0.05; EXE mean improvement: 0.04 m, p<0.05) with no significant differences between the groups (p>0.05).
CONCLUSION: Variation in training applied through the manipulation of exercise intensity was as effective as that applied through the manipulation of exercise selection for improving strength and power in collegiate track and field athletes during a 4-week block. Both variables are equally important when considering implementation into programming for athletic populations.

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Diurnal Sensitivity Of Muscle Force And Acceleration Parameters Of The Upper Limb

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(No relationships reported)

Novel technology permits more precise investigation of motor function. Limited data exist on diurnal variation in force and acceleration parameters of the upper limb.
PURPOSE: To detect the optimal time of day for maximum power output and development rate in unilateral row and press motions.
METHODS: We tested 112 physically active male and female subjects on Proteus (Proteus Motion, USA). In total, they performed 2,750 unilateral, isotonic sets, evenly divided between rows and presses. Loads were applied through three-dimensional magnetic resistance at 10lb (862 sets), 15lb (646 sets), 20lb (612 sets), and 25lb (630 sets). Testing was performed at various times over a 14-hour span (6:00am to 8:00pm). For each individual set, Proteus calculated average peak power of all repetitions (PP_{mean}), highest power achieved during any single repeition (PP_{max}), average peak force development rate across all repetitions ($PFDR_{mean}$), and the highest rate achieved during a single repetition ($PFDR_{max}$). Mixed model ANOVA with repeated measures tested the differences in these parameters between push and pull motions, loads applied, and times of day. Linear regression models isolated the effect of time on performance holding other influential factors constant.
RESULTS: Across all movements, loads, and times, PP_{mean} was 235.2 ± 114.1 w; PP_{max} was 254.1 ± 120.0 w; $PFDR_{mean}$ was 1,036.1 ± 631.6 w/s; and $PFDR_{max}$ was 1,243.4 ± 789.6 w/s. Differences in both PP_{mean} and PP_{max} were detected by time of day (p<0.001) and load (p<0.001). The highest values were achieved between 2:00pm and 4:00pm. Similar relationships were found with time of day in $PFDR_{mean}$ (p<0.001) and $PFDR_{max}$ (p<0.001). Holding constant the subject performing the set, arm dominance, exercise being performed, and the load applied, linear regression analyses found that if performance occurred between 2:00pm and 4:00pm, there was a 139.6 w/s increase in $PFDR_{mean}$ (95% CI: 75.5-203.6), 164.7 w/s increase in $PFDR_{max}$ (95% CI: 79.7-249.8), 29.6 w increase in PP_{mean} (95% CI: 20.7 ± 38.5), and 33.6 w increase in PP_{max} (95% CI: 24.4 ± 42.8).
CONCLUSIONS: Success in many athletic contexts depends on expressions of power and the rate of its development. Our findings demonstrate diurnal rhythms in power parameters of the upper limb, with optimal performance occurring in the afternoon.

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Assessing True Variability And Mean Changes To Two Distinct Resistance Training Protocols

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(No relationships reported)

Millions of dollars are spent analyzing inter-individual differences in response to resistance exercise, but the lack of a non-exercise control group makes it possible that these studies may simply be examining random error. Furthermore, it has been hypothesized that the magnitude of variability may differ depending upon the exercise protocol employed, but this yet to be appropriately tested.
PURPOSE: To determine differences in two distinct resistance training protocols and whether true variability could be detected after accounting for random error.
METHODS: Individuals (n=151) were randomly assigned to one of three groups: (1) a traditional exercise group performing four sets of elbow flexion exercise to failure; (2) a one-repetition maximum (1RM) performing a 1RM elbow flexion test; and (3) a time-matched non-exercise control group. Both exercise groups performed 18 sessions over six weeks. A Bayesian ANCOVA was used to test for mean changes across groups while adjusting for pre-values. To assess whether the variability in response to each exercise intervention differed from that of the control group, Bayesian Levene's tests were computed. Bayes Factors (BF_{10}) were used to quantify evidence for or against the null hypothesis.
RESULTS: Both 1RM (2.3kg; BF_{10} = 4.791e+6) and traditional training groups (2.4kg; BF_{10} = 11,915) increased 1RM strength similarly (BF_{10} = 0.21), but only the 1RM group increased untrained arm 1RM strength (1.5kg; BF_{10} = 271). Only the traditional exercise group increased ultrasound measured muscle thickness (~0.23 cm across all sites; all $BF_{10} \geq 224$). Across both training groups, the only differential responses were found in the change in 1RM strength of the trained arm in the traditional training group (BF_{10} = 5.381). This resulted in a true variability of 1.8 kg after the removal of random error.
CONCLUSION: These findings demonstrate the importance of taking into consideration the magnitude of random error when determining response heterogeneity, as many studies may be classifying individuals based on random error. Additionally, our mean results demonstrate that strength is largely driven by task specificity, and the cross-over effect of strength may be load dependent.

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Progressive Movement Training: An Analysis Of Its Effects On Muscular Strength And Power Development

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(No relationships reported)

Muscular strength and power are important attributes in many sports, so research on resistance training (RT) methods that may improve these attributes are of great interest. One such RT method is Progressive Movement Training (PMT) which incorporates a partial range of movement (ROM) with a supramaximal load.
PURPOSE: This study compared the effects of PMT and traditional full ROM RT on the 1-RM back squat (BSQ), vertical jump (VJ) height, and power output (PO).