metronomes. Outcome measures assessed during the concentric phase were: average concentric velocity (ACV), peak concentric velocity (PCV), rating of perceived exertion (RPE), range of motion (ROM), and barbell path. A one-way ANOVA and Pearson's Product Moment correlations were used for analysis with significance set at $p \leq 0.05$.
RESULTS: Eccentric duration was significantly and inversely correlated with average concentric velocity (ACV) at 60% (r = -0.408) and 80% (r = -0.477) of 1RM squat and at 100% (r = -0.604) of 1RMM bench press. At 60% of 1RM squat, both fast and slow eccentric conditions produced greater ($p<0.001$) peak concentric velocity (PCV) than normative duration with fast also producing greater PCV than slow (p=0.044). Eccentric duration had no impact on RPE, ROM, or barbell path.
CONCLUSIONS: Therefore, our results show that well-trained athletes performing a deliberately faster eccentric phase may enhance squat and bench press performance. However, caution should be used when interpreting these results as athletes who already perform a fast eccentric duration may not benefit from deliberately increasing eccentric velocity.

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Workout-Life Balance: How Psychological Stress Affects Force Production in Competitive Powerlifters and Healthy Controls

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(No relationships reported)

Powerlifters often focus more on physiological stresses of programming and performance than psychological stress. However, total allostatic load could influence the capacity to generate force. Understanding this relationship can give coaches and athletes tools to optimize workout-life balance.
PURPOSE: To determine the effect of psychological stress on force production in distinct populations.
METHODS: Competitive powerlifters (PL) and recreationally active college students (RA) were tested. The RA group consisted of 10 men and 13 who performed knee extension and flexion at 2 time points using a Cybex dynamometer: Once during an academic respite and once during exams. Psychological stress was assessed with a 10-Point Cohen Perceived Stress Scale Questionnaire. Linear regression measured the effect of psychological stress on peak force. The PL group consisted of 26 men and 8 women competing in the 2018 USAPL Raw Nationals. The day before the competition, all athletes were interviewed; peak and expected performances and 10-point stress were recorded. Linear regression tested the effect of stress on the difference between expected and achieved performances.
RESULTS: In the RA group, between the 2 time points, men produced 257.5 ± 68.9 ft-lbs of torque for flexors and extensors summed; women produced 213.5 ± 26.6 ft-lbs (p=0.082). Holding bodyweight constant, stress did not affect peak torque at time point 1 (p=0.217) or 2 (p=0.506), and change in stress did not affect change in force output (p=0.640). Sex was insignificant in all analyses and no relationships emerged when evaluating flexors or extensors separately. In the PL group, the summation of bench press, squat, and deadlift was 625.4 ± 74.4 kg in men and 377.8 ± 79.5 kg in women ($p<0.001$). In the regression analysis (R^2=0.325; p=0.003), holding weight class constant, the deficit precipitated by psychological stress was 3.4 kg per point (p=0.006; 95% CI: -5.69 to -1.06). Results were stronger for women (R^2=0.824; p=0.013); holding weight class (p=0.032) constant, each additional point of stress predicted a 4.8 kg reduction in performance (p=0.005; 95% CI: -7.43 to -2.27).
CONCLUSION: Psychological stress does not impair strength performance among untrained individuals. However, stress management may be critical for strength athletes, particularly women.

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A Three-Dimensional Assessment of Push-Pull Power Ratios Across Various Loads

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Capturing a true assessment of power in upper body motions is problematic owing to difficulty reproducing a testing environment that matches kinematic profiles performed in sport. New technology permits more accurate reflections of three-dimensional power in isotonic environments.
PURPOSE: To quantify power ratios of single-arm press and pull exercises across various loads.
METHODS: 64 subjects performed a total of 1,145 sets on Proteus (Boston Biomotion, Inc.): 570 sets of single-arm horizontal presses and 575 sets of single-arm horizontal rows. All subjects performed both exercises. Three-dimensional magnetic resistance was applied at 5, 10, 15, 20 and 25lb. ANOVA tested the subjects' kinematic profile across loads.
RESULTS: On average, across all sets, maximum power per set was 175.2 ± 103.0 for presses and 183.6 ± 108.5 for pulls. For mean power throughout a set, subjects achieved 159.5 ± 96.3 for presses and 168.2 ± 102.5 for pulls. The different loads had significant differences for maximum ($p<0.001$) and mean ($p<0.001$) power; the higher the load, the higher the value in each measurement. At a 5lb load, maximum power (presses and pulls combined) was 31.7 ± 10.8; at a 25lb load, it was 366.4 ± 96.0. Similarly, for mean power, at 5lb, subjects achieved 26.8 ± 10.2 while at 25lb, it was 335.1 ± 92.0. Dominant and non-dominant arms were similar in maximum (p=0.497) and mean power (p=0.530) although overall, pulling was stronger than pushing. Across all sets and loads, push-to-pull ratio was 0.95:1 for both maximum and mean power. This ratio changes at different loads. For peak power, at 5lb, the push-to-pull ratio was 1.22:1. At 10lb, it was 0.99:1. At 15lb, it was 0.98:1. At 20lb, it was 0.95:1. At 25lb, it was 0.94:1. For mean power, the same pattern, though slightly more extreme, was found.
CONCLUSIONS: Numerous investigations have quantified ideal force ratios of the knee while similar assessments of the upper limbs have received relatively little attention. New technology provides a systematic approach to measure strength ratios of the shoulder and elbow in three-dimensional space. In this context, strength ratios change with load; push power exceeds pull power at low loads whereas the inverse is true at higher loads. These strength ratios may be considered for sport application and recognition of risk for upper limb injury.

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Correlations Between Resistance Exercise Repetitions Achieved At 60% And 80% 1rm Load In Female Subjects

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To determine the appropriate load for resistance training (RT), exercise professionals (EPs) commonly have clients complete one repetition maximum testing (1RM). Then, submaximal loads can be easily calculated for RT sessions. A higher load (approximately 80% 1RM) is chosen if lower repetitions (reps) are desired (≈ 10 reps) and a lower load (approximately 60% 1RM) is chosen if higher reps are desired (≈ 20 reps). However, the number of reps generated (at both low and high loads) varies quite dramatically in standard populations. It is important to determine if there are strong relationships between the number of reps generated at lower and higher loads. The hypothesis is that individuals tend to perform similarly at different loads (i.e. generate above average reps at both loads or below average reps at both loads). However, this topic has not been thoroughly studied.
PURPOSE: Determine correlations between RT reps achieved at 60% 1RM load and 80% 1RM load. This will help us understand if the number of reps generated at lower loads predicts the number or reps generated at higher loads.
METHODS: Participants were 19 college-aged (25 ± 4.3 years) females with a minimum of 2 months RT experience. Three exercise sessions were completed under the supervision of certified EPs. For session one, 1RM testing was completed. For sessions two and three, participants completed as many reps as possible for 60% 1RM or 80% 1RM (load and order was randomized) for 8 cam-mediated variable resistance training exercises. For all 8 exercises, Pearson correlation was used to assess the strength of the relationship between the two loads.
RESULTS: The reps generated at 60% 1RM and 80% 1RM and correlations between the two were determined for the following 8 exercises: bench press (8.2±3.4 reps to 18.3±4.2 reps; r = 0.51), leg press (17.9±5.0 reps to 37.3±15.9 reps; r = 0.63), shoulder press (7.8±2.5 reps to 13.6±3.5 reps; r = 0.59), pull-down (10.3±2.1 reps to 24.1±8.3 reps; r = 0.05), knee extension (11.4±4.7 reps to 17.3±5.8 reps; r = 0.71), knee flexion (12.4±4.5 reps to 23.4±6.7 reps; r = 0.74), elbow extension (12.5±5.0 reps to 23.0±10.3 reps; r = 0.63), and elbow flexion (9.9±5.4 reps to 17.3±6.4 reps; r = 0.86).