Power for Performance

Increasing interest in personal training has focused on training for sports performance. More participants in recreational and organized sports are recognizing the importance of conditioning for competitiveness and injury prevention. Personal trainers can take advantage of this growing market-interest by becoming more proficient in the techniques that can be used to enhance speed, power, quickness, and specific movement economy. Immediate limitations though, stand out in personal training for these goals, compared to traditional strength and conditioning programming due to the limited contact time. Strength and conditioning programming is usually developed in a 4-7 hour contact framework, whereas most personal trainers must develop similar outcomes in half of that time.

For this reason, personal trainers should look for the optimal training techniques and specific criteria that support efficient outcome. Some classic observations should come to the forefront when focusing physical training on sports performance. Firstly, the best sports conditioning program is one that prevents injury and allows the athlete maximal playing time. Million dollar athletes are not worth a dime sitting on the sidelines due to injury. Secondly, muscle strength-balance and neuromuscular efficiency (economy of movement) are far more important outcomes than improvements in measurable absolute strength. In no sport does one slowly squat to the ground with hundreds of pounds on their shoulders, nor does any sport require an athlete to lie on the ground and press a heavy load off their chest in a controlled manner. Training for sport should advance the participants' capacity in the specific energy system used in the sport, enhance movement proficiency at the velocities experienced in the sport, focus on prevention of the common injuries of the sport, and optimize the performance components albeit power, speed, quickness, etc…used most often in the sport.

In most sports, speed is a defining factor in performance outcomes. What many fail to realize is strength does not make you fast. Strength enhances power and power makes you fast. In comparative studies, Olympic lifts correlate with higher vertical jump, and consequently vertical jump correlates with speed. When power training using the Olympic lifts (Cleans, Jerks, Snatches) was compared to strength training using the traditional power lifts, (Bench, Squat, Deadlifts) for outcomes on combine-related tests (bench press, squat, vertical jump, 40-yard dash, vertical power) for the sport of football, the importance of Olympic-based power training identified significant relevance. Although both groups saw statistically significant improvements in 1RM squat, the Olympic lift group was observed to have a significantly greater improvement in vertical jump. Additionally, the Olympic lift group experienced a two-fold greater improvement in 40-yard sprint time. The training though, showed no significant differences between the other measured indices.

The above findings suggest that power training is invaluable in improving jump and speed performance but should not be the only training employed. This fact is supported by additional research that compared power training alone with a regimen of strength and power training. When twenty-six recreationally trained male subjects

performing power training only (jump squats) were compared to a group engaging in strength-power training (jump squat and heavy back squats) at equal training volumes for 12 weeks, the Power-only group significantly increased peak power at the lowest loads, whereas the Strength-Power group significantly increased peak power output across all loading conditions. Similarly, peak jump height was significantly increased by the Power group at the lighter loads (20-40 kg) and the Strength-Power group again improved at all loads (20-80 kg). Interestingly, both were comparable in peak power and maximal jump height at bodyweight, which suggests training decisions must reflect the resistive demands of the sport. Training with light load jumps (10% body weight) resulted in increased movement velocity capabilities as velocity specific changes in muscle contractions play an important role in power adaptations. Whereas a football player requires added loading in addition to body weight plyometrics to account for the varied demands of the sport, a diver may be just as successful with low load, high velocity training alone.

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When load is considered in power, training percentages of 1RM have been defined for maximal power output. Strength training requires heavy loads (80-95%) at low velocities, but power training is better optimized at lower loads for peak velocity. Numerous studies have identified that for optimal power output 55-59% of 1RM is the ideal training intensity range. Additionally, loads of 47-63% have a similar effect in maximizing power. Therefore manipulating training intensity to reflect the location of the exercise within the training bout can still allow for high peak power even after several activities have been performed. But, like strength training, reducing the intensity too low has negative outcomes. Studies have shown that training below 46% 1RM results in significantly lower outputs. Lower resistant intensities can still be used for lactate conditioning where a somewhat continuous volume of work is emphasized, but for peak power, intensities should be above the 45% mark.

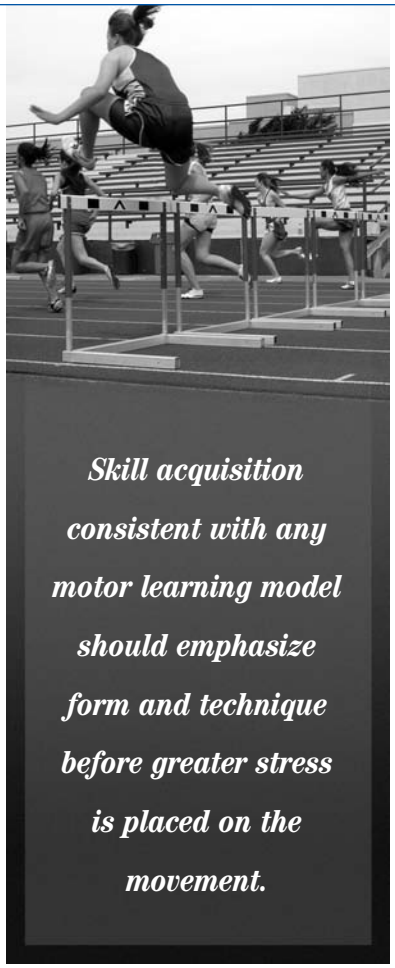
Concentric acceleration is another area that should be addressed for sports that demand starting speeds. Concentric force development is critical to sprint start performance and accordingly, maximal concentric jump power is related to sprint acceleration. These findings suggest that non-counter movement jump activities should be infused in the training. Commonly, concentric squat jumps, split squat jumps, varied stance vertical jumps, and non-counter movement box jumps are used to encourage concentric acceleration without the use of the stretch shortening cycle. Generally, 5-10 seconds of transitional rest between jumps is used to re-establish jump position when not using rebounds. Consistent with the aforementioned, loaded concentric squat jumps produce peak power between 50% and 70% 1RM (back squat), but split squat jump peak power is attained at lower levels 30-60% 1RM (axial loaded split squat). This is due to the mechanically disadvantaged start position of the split squat.

When programming power into workouts that are combined with strength and fitness activities the exercise order should reflect the speed and difficulty of each movement. Essentially activities that generate the highest power outputs should be performed first, unless a specific risk is involved. For instance, Olympic lifts are generally performed at the start of the exercise bout. Likewise, loaded jumps and body weight jumps supersede strength exercises when performed for maximal velocity and peak power. Strength exercises should be completed after power as they cannibalize power output. In a research study, when bench press was performed (3 sets of 10 repetitions, 65% 1RM) before bench throws using 40 kg of resistance, power significantly declined in post-test measures. In the study, when between-exercise rest was increased to seven minutes, power output remained suppressed from pre-test values. This differed for individuals performing bench throws-only, who maintained their power from pre-test to post-test. Interestingly, the strongest individuals experienced the greatest decline in power following the bench performance. These findings suggest that power exercises ordered after hypertrophy and strength training will not elicit the neural/velocity stimulus needed for optimal power enhancement.

When strength sets are super-setted with power sets using contrast training the outcome is beneficial for power output rather than detrimental. A contrast set uses a heavy strength movement followed immediately by a power exercise using the same movement. The back squat

performed for 6 repetitions immediately contrasted with 6 repetitions of medicine ball squat jumps is an example of this type of training. A study comparing bench throws on a Smith machine found that when athletes performed 6 repetitions of bench press (65% 1RM) before six maximal bench throws, post-test power was higher than the group that performed subsequent sets of bench throws-only. The power measure was 4.5% higher in post-test measures when using the contrast sets compared to the power-only exercises. This response is likely attributed to acute neural/mechanical adjustments associated with the pre-power strength sets.

The correlation between power output measures and movement speed and jump height suggest that training for sports requires velocity specific programming to improve the neural system adaptation. A key component is stimulating the optimal recruitment patterns and maximizing the neural mechanisms that enhance power output. Strength training certainly serves as an important complement, but when used independently will not provide the same outcome in performance that training for power will. When introducing power exercises into a personal training program, consistent program principles apply. Exercises should match the participant's capabilities and be consistent with the program's training phase. Strength and endurance preparation cycles should precede power programming to ensure the participant can safely manage the training. This is particularly true in managing the eccentric phase of the movements. Flexibility should also be carefully considered as many movements ballistically force greater movement range. Skill acquisition consistent with any motor learning model should emphasize form and technique before greater stress is placed on the movement. Introductory, body weight plyometrics are often a good starting point. Loading should be thoughtfully progressed and movement technique should be heavily scrutinized as progressions are added.



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Power training can be fun, add a competitive feel to training, and dramatically enhance results when programmed properly. Premeditated phases of training can be used to gradually increase the demands on the tissue. Velocity specific movements are a very important component to the training, so emphasis on movement speed should be preferred over heavy resistance. Although optimal training load ranges occur between 50-60% 1RM it may be prudent to work up to such levels even if an individual is "strong" at the strength lifts. It is important to remember, higher velocity training compounds the resistance used, equaling high forces to manage in the end. Therefore mental focus, appropriate preparation, and client appropriate activities are all key factors when adding power training for sports specific programming.