

POWER DEVELOPMENT IN ATHLETES: PRACTICAL CONSIDERATIONS FOR COACHE

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INTRODUCTION

Strength, speed, power—it may be impossible to find a coach in any sport who is not interested in developing these qualities in athletes. Yet, despite this desire by coaches, the process for developing these qualities may be unclear because of the proliferation of fads and misinformation related to strength, speed, and power development.

In general, there are five theories that influence strength training: bodybuilding, high-intensity training, weight lifting, power training, and periodization of strength.

1. Bodybuilding is chiefly concerned with increasing muscle size by performing sets with six to 12 repetitions to exhaustion. Few athletes benefit from increased muscle size alone.
2. High-intensity training uses heavy training loads all year with all exercises performed to failure. High-intensity training programs are not organized with a competition schedule in mind.
3. Weightlifting involves traditional exercises like the clean and jerk or power clean. Some experts question whether improvements in these movements translate into improved sport performance.
4. Power training uses exercises like bounding and medicine ball training to try and improve explosiveness. Yet, because maximal strength is a key component of power, power training alone may not optimally improve sport performance.
5. Periodization of strength training involves emphasizing different types of strength training during different times of the year with the goal of peaking for the most important competitions.

Prior to undertaking any form of strength training, coaches and other trainers should consider the following general principles of athlete development:

Individualization of training.

Individual athletes respond differently to training stimuli; a workout that may help one athlete improve may hinder improvement in another athlete. Fatigue, nutritional status, stage of development and other factors must be considered prior to designing training for each athlete.

Proper progression.

Coaches should evaluate their athletes' current training status and then design training to achieve a specific goal. To achieve this goal, athletes ought to progress steadily and gradually with training loads commensurate with their ability to perform the training load.

Progressive overload.

To improve, athletes must increase the load lifted to maintain the same relative intensity with increasing strength. The purpose of training is to place greater training demands on athletes so that they adapt and, as a result, improve.

Combining general and specific strength/power.

General strength/power relates to developing core (abdominal, back, and upper leg) muscles to serve as the foundation for a strength and conditioning program. Specific strength/power entails developing muscles for the distinct movements related to a particular sport. A good training program incorporates both general and specific strength/power exercises 2.

Proper recovery.

Athletes improve during recovery, not training; the purpose of training is to cause adaptation that takes place during recovery. Coaches must plan and prepare as much for recovery as they do for training.

Safety/Injury prevention.

Coaches must make safety a paramount consideration prior to designing any training program. Athletes must have a physician conduct a musculoskeletal exam prior to participating in any strength and power development program. The team physician should be part of the conditioning network.

Just as athletes seek to continuously improve, coaches should seek to continuously improve their knowledge. It is the responsibility of every coach working with athletes to know as much as possible about the training that affects those athletes' lives and aspirations.

WHAT IS POWER?

Power is how fast you do work. It is influenced by maximum strength and speed of movement. Coaches seeking to improve power must consider how to make their athletes stronger and faster. Specifically,

$$\text{Power} = \frac{\text{Force} \times \text{Distance}}{\text{Time}}$$

where **Force** = pushing or pulling a mass, body, or object (MBO) such as a barbell, shot put, human body, somebody else's body, water, etc.

Distance = how far and

Time = how long it takes.

Thus, to improve power, coaches must coach their athletes to do one of the following:

1. Move an MBO farther in the same time, or
2. Move an MBO the same distance in less time, or
3. Move a bigger MBO the same distance in the same time, or
4. Any combination of the above.

For example, to improve power as it relates to an athlete's vertical jump, a coach must teach and motivate the athlete to:

1. Jump with the same weight higher in the same amount of time, or
2. Jump with the same weight in less time (i.e., decrease floor contact time), or
3. Jump with additional weight in the same amount of time and height, or
4. Any combination of the above.

HOW DO YOU DEVELOP MORE POWER?

Prior to designing a training program to improve power, coaches should determine where the athlete has the greatest room for improvement in terms of the components of power: distance, speed, or strength.

To design a power development program, coaches should consider the following general guidelines:

To develop more sport-specific power, coaches should consider the Power Development Pyramid to begin a power development program; coaches must ensure that their athletes have a good foundation of core stability and technique. Core stability involves strengthening the trunk muscles. Coaches must incorporate back and abdominal strengthening exercises into their program. Proper technique ensures that athletes remain injury-free and have the greatest room for improvement.

The next phase of power development incorporates slow speed, high force movement exercises to build the strength component of power. These exercises involve using heavy resistance, generally with few repetitions.

After developing a good base of core stability, technique and strength, athletes can move into the power development zone. The first stage in this zone focuses on fast speed, low force movements. This stage can consist of performing the same exercises as in the slow speed, high force program with lighter resistance. To ensure maximal results, athletes must focus intently on executing all movements as quickly as possible.

Finally, athletes are ready to move into the sport specific power development phase of training. This phase entails making sport-specific movements with light to moderate resistance as quickly as possible.

Of course, a complete training program incorporates maintenance aspects of each level of the Power Development Pyramid. Coaches also should consider the following general characteristics of power training in a weight room:

- Athletes should warm-up adequately.
- Power exercises should be performed at the beginning of workout.
- Appropriate high velocity exercises should be used for power training.
- All exercises must be performed with all out effort and correct form.
- Adequate rest must be given to perform all exercises at the same intensity.
- Training should be structured with multiple sets of low repetitions at varied loads.
- Dynamic exercises incorporating multi-joint movements are preferable for improving sport-specific power.
- Programs should be periodized over time.

Coaches should consult with a trained strength and conditioning specialist to help design, implement, and monitor any power training program.

ASSESSING POWER DEVELOPMENT

Responsible coaches continually monitor their athletes' progress to determine whether training is having the desired result. In fact, testing and evaluation should be part of a seasonal training plan. At a minimum, training logs should be used to track workout results.

Coaches also should incorporate a regular testing program to assess the training program. The testing program should consist of general power evaluation for overall improvement and specific testing to determine whether power training is having an impact on sport-specific movement. For example, a swim coach could use a vertical jump test to assess general power development and a swim power test in the pool to assess swimming-specific power development. Coaches should consult with strength and conditioning specialist for help in designing their testing program.

Ultimately, the goal of any training program is improved performance on the field, in the

pool or on the court. A coach should evaluate the effectiveness of any power development program with this goal in mind. When objective performance measures like time or distance cannot be used, the experienced eye of a coach remains the only means of evaluating training effectiveness.

RECOVERY FROM POWER TRAINING

Athletes must be well-rested to train for power development. Fatigued athletes simply cannot perform movements explosively enough to make the necessary adaptations for power development. To develop maximal power, power training must be performed at the beginning of workout before athletes have expended energy on other forms of training.

Thus, coaches must plan for recovery with as much foresight as any other aspect of training. This recovery plan should include provisions for ensuring that athletes eat properly and are well-hydrated. In the most basic terms, athletes must eat regular, balanced meals and drink plenty of fluids. Without this nutritional base, power training may be less effective.

The recovery plan also should consider athletes' sleep habits. Athletes in training need, at a minimum, six to eight hours of deep sleep every night. Sleep deficits can significantly impede training efforts.

Coaches should consult with appropriate professionals about proactive restoration techniques like massage therapy or relaxation/stress management programs with appropriate experts to ensure that athletes are recovering properly.

The most important recovery tool in a coach's arsenal, however, is communication. Coaches must communicate with athletes to determine whether they are recovered enough to train for power. A good three-minute discussion can be an effective monitoring tool for recovery status.

CONSIDERATIONS

Power training is a complex process that can help athletes achieve their goals or, if done improperly, injure and cause poor performance. Coaches should not incorporate power training into their program without considering the following:

- A pre-season medical exam that includes a muscular skeletal exam.
- A comprehensive pre-training evaluation to determine the core stability and skill technique needs that are the foundation of a power development program.
- An assessment of appropriate age/developmental level needs.
- A seasonal plan that details proper training progressions so that athletes do not injure themselves by doing too much too soon.
- Power training must never be done without appropriate supervision by a trained professional coach.
- The entire training process should be communicated to athletes, parents, medical staff, and

coaches so that everyone understands the goals, and how those goals are to be achieved.

A network of professionals is important to this process.

Appropriate power training can help athletes explore the limits of their talents. Because athletes entrust coaches with those talents, it is the coach's responsibility to seek continuing education and knowledge to plan, implement, and monitor power training. Coaches also should consult with an appropriate strength and conditioning professional on all aspects of power training.

Many aspects of competitive athletics are out of the hands of the coach, athlete and fellow competitors. Official's decisions and weather can't be controlled, but anyone can train to become more powerful. Every athlete can improve their strength, speed, and power with a well-thought plan, competent coaching and motivation. An athlete can only go as far as their ability, courage, commitment and coach can take them. It's time to power up!

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