Basics of Power and Strength Development

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Coaches who are well read in the area of strength training will attest to the fact that considerable differences exist in training beliefs, philosophies, and the concurrent day to day implementation of techniques and exercises. As we have stated here many times in the past, any program that holds true to the tenets of comprehensive training and progressive overload will accrue excellent results.

One variable that you will find a consensus of agreement on is the inseparable marriage of strength and power. While definitions and program designs for enhancing each are numerous and sometimes contradictory, no one can dispute their important relationship.

Over the course of our twenty-five years of experience in this field, we have studied just about every type of strength/power training system currently employed, and we feel that ours is at least as effective as any of them. In addition, it's our opinion that our approach is safer than many we've seen.
We would like to share this paradigm and the rationale behind it with you.

PHYSIOLOGY 101: UNDERSTANDING THE BASICS
Two critical factors that contribute to strength/power development are muscle hypertrophy (i.e., growth) and adaptations in the nervous system.
Increases in the amount of actin and myosin (the tension generating units of muscle tissue) are major constituents in force production, and, ultimately, power improvement. Properly performed strength training initiates the proliferation of actin and myosin and also magnifies the strength of tendinous and ligament (i.e., connective) tissues.

From a neural standpoint, our muscles are constantly receiving what are termed "excitatory" and "inhibitory" messages from the nervous system. Excitatory messages, as the word implies, force our muscles into action. Inhibitory messages act to hold us back, and, in some cases, serve to protect us. For example, if we are not physically prepared to lift a heavy object, a message will be sent to the involved musculature to relax in order to prevent injury.

As an individual progresses in a strength-training program, the inhibitory messages are gradually reduced. This is a result of the increased strength and skill improvement in handling the given loads and exercises. The reduction of the inhibitory messages allows the trainee to recruit a larger than normal amount of muscle mass at a given time, resulting in greater force production with concomitant power enhancements.

FAST TWITCH VS SLOW TWITCH
Our muscle tissue is comprised of a spectrum of fibers that have varying endurance and force generating characteristics. For the sake of this discussion, we will simply refer to them as either slow twitch or fast twitch fibers.

Slow twitch muscles fibers cannot produce as much force as fast twitch fibers. Fast twitch fibers also generate a given level of force in a shorter period of time than slow twitch fibers. Obviously, for activities requiring high power outputs, the recruitment of fast twitch fibers is paramount.

Muscle fibers are recruited according to what is known as the "size principle." Simply put, the fibers are activated, from smaller to larger (slow twitch to fast twitch), relative to the force requirements of the task. Initially, if the force requirements are low, the slow twitch fibers are capable of handling the load. As the force requirements are heightened to a level where the slow twitch fibers can no longer sustain the effort, the fast twitch fibers are then activated.

Our neuromuscular system is very cost-efficient in fiber recruitment; only the type and amount of fibers needed to complete the task are called upon.
An interesting precept here is that it is not the speed of the movement, but rather the force requirements of the movement, that dictate the type and amount of muscle fibers to be activated. For example, it is quite possible to lift a relatively "light" object very quickly, with low intensity, and activate only slow twitch fibers. Conversely, lifting a relatively "heavy" object in a controlled fashion, but with high intensity, will eventually activate the fast twitch fibers.

Why does this happen? Simply, the heavier object, even though lifted in a slower fashion, creates more muscle tension and requires a higher force output than the lighter object lifted at a faster speed.

Therefore, at least in the weight room setting, the focus should be on incorporating movements and techniques that produce high tension, not high speed.
Later, we will explain how to utilize this newfound strength/power in the athletic setting. At this point, however, we will describe the strength-training guidelines and techniques that are extremely efficient in the recruitment and development of these power-producing, fast twitch fibers.

THE STRENGTH AND POWER GAME PLAN
Now that we have a simplified physiology construct in place, let's identify the key principles for strength/power augmentation in the weight room.

1. Perform perfect reps:
· Repetitions should be performed with a smooth and controlled movement speed. While a designated cadence is not mandatory, a good rule of thumb is to execute the concentric phase (raising) of the rep in 1-2 seconds, and the eccentric phase (lowering) in 3-4 seconds.
· When possible, a slight pause (1-second) is suggested at the mid-range position of the rep. This will ensure a smooth transition between the concentric and eccentric phases, while providing an additional stimulus to the target area at its point of full contraction.

2. Create and maintain constant muscle tension:
· The purpose of a properly performed rep is to create and maintain tension within the targeted musculature. This tenet invokes the sought after muscle fiber recruitment pattern (i.e., the "size principle").
· In order to achieve this, it is necessary to minimize momentum when performing repetitions. Avoid jerking, bouncing, throwing, and dropping the load. The target musculature should be forced to perform the required work. Lift the weight, don't throw it; lower the weight, don't drop it.
· From a safety standpoint, this rule will aid the trainee in maintaining the correct body posture for each exercise, which lessens the probability of injury.

3. Use the heaviest weight safely possible for the given rep range:
· Strength training is hard work. It is not merely a matter of weights going up and down. Muscles respond to the demands placed on them. Rep ranges can and should vary (e.g., 6-10, 10-15, 15-20, etc.) for appropriate adaptations and variety.
· The one constant, however, is that we instruct our athletes to work in those rep ranges with the heaviest weight safely possible.
· For the most part, our guiding principle regarding intensity of effort is as follows: If you could have done another rep with proper form, you should have done it. Exceptions to this rule would be exercises like the barbell squat, where the nature of the movement would compromise safety if it were done in an all-out manner.
· Safety is the operative word with this guideline. We never compromise our number one priority in the weight room - the health and well-being of our athletes. When all safety considerations are documented and understood by everyone, it is absolutely possible to train with both intensity and common sense.

4. Train in a comprehensive fashion:
· All of the major muscle compartments (i.e., neck, hips/legs/low back, mid-section, torso, and arms) should be addressed during the course of the training week. This is not to say that every area needs to be trained during each workout, but by the completion of 2-3 workouts, all of the aforementioned areas should have been stimulated.
· This axiom will avert imbalances in these complexes and concurrently minimize the associated injury potential.

5. Have a plan for progressive overload:
· Accurate record keeping in strength training is critical. Over time, a plan for increasing the reps and/or weights must be in place for gradual, progressive enhancements in strength/power to be realized.
· Our plan is simple in design, difficult in physical execution. Known as "double progression," it involves working with the same weight in a designated rep range (e.g., 6-10) until the high end of the range is attained. The weight is then increased anywhere from 2.5 to 10 lbs., depending on the exercise and area of the body in question. Single-joint (e.g., leg extension) exercises are increased 2.5-5 lbs., multi-joint exercises (e.g., leg press) are increased 5-10 lbs.

FROM THE WEIGHT ROOM TO THE FIELD
In our past articles on skill development and specificity, we've discussed the separation of weight room skills and athletic skills. To sum it up here, make sure you are training for the skills you expect to be learned.

Strength training is vital in developing the needed strength/power for the execution of various sport skills. However, the lifting skills themselves do not transfer to the proper execution of any sport skill.

As the skeletal muscles are developed with strength training, the challenge then becomes learning to demonstrate this newly acquired strength/power in the required sport skills. The neuromuscular adaptations garnered from strength training can greatly assist in sport skill power - but only with specific practice of the sport skill(s) in question.

Reference:
Maximize Your Training: Insights from Leading Strength and Fitness Professionals, (Brzycki, M., editor) 1999, Masters Press, Chicago, IL.