

# ***STRENGTH & POWER TRAINING DEVELOPMENT***

## ***BASIC LAWS OF STRENGTH TRAINING***

- 1. Develop Joint Flexibility** - Good flexibility prevents stress injuries.
- 2. Develop Tendon Strength** - Tendons and ligaments grow strong through anatomical adaptation.
- 3. Develop Core Strength** - The core muscles act as shock absorbers for jumps, stabilize the body for locomotion and represent a link between the arms, the legs and the ground. Weak core muscles fail in these essential roles limiting the athlete's ability to perform.
- 4. Develop the Stabilizers** - Improperly developed stabilizers inhibit the contracting capacity of the prime movers thus affecting performance in a negative way.
- 5. Train Movements, Not Individual Muscles** - Resist training muscles in isolation. Athletic skills are multi-joint movements occurring in an order called a kinetic chain. Strength training should mimic the sport skills as much as possible so there is a greater carry over to athletic performance.  
One joint exercises develop movement patterns that will interfere with patterns used in sport. One joint exercises can lead to inappropriate muscle recruitment patterns that could impair performance and result in injury. Use whole body exercises like dead lifts, cleans, pulls, pull ups, pulling knees to chest from a hanging position, wood choppers, squats and presses.
- 6. Keep the total number of sets performed in a training session in the weight to under 24.** Beyond 24 sets the body's hormonal system cannot keep up to create anabolic or growth mode. Greater results over the long haul will be attained by keeping the weight room training sessions to 12 to 20 sets of lifting performed in 40 minutes or less.
- 7. Greater strength gains and stability are realized through the use of free weights as opposed to machines.** We live and perform in a 3D world. We need to train that way!
- 8. Never interpret soreness or stiffness as a sign of progress!** No correlation has ever been established between getting sore and getting stronger.
- 9. Stretch and perform flexibility exercises after every training session.** This will enhance your strength development and adaptation.

**Periodization** - is an advanced form of training that varies the volume and intensity to avoid over-training and to optimize improvement and performance.

The progressive variation in both in volume and intensity optimizes strength gains. Research comparing traditional strength and aerobic training with periodization training has proven that athletes on a systematically planned training program, that varied volume and intensity, made significantly greater improvements in both strength and endurance.

## ***TRAINING PHASES***

**Pre Season or General Adaptation Phase** - The first phase of development is the Anatomical Adaptation Phase (AA). The main objective for this phase of training is to develop a base volume of training for the body's

muscles, joints, tendons and ligaments for the upcoming season. The body's muscular system develops at a much faster rate than the adjoining tendon and ligament systems. The proper anatomical adaptation phase allows the tendons, and their respective attachments, time to thicken and hypertrophy. This adaptation will lessen tendon and ligament injuries later in the season when high intensity work is executed.

One of the goals of this phase of training is to balance muscular strength between the right and left sides and the front and back sides. Circuit training is a great method to start in training in this phase.

#### **Training Parameters of Work**

Duration of Anatomical Phase: 4 to 6 weeks - Longer if strength is less important

Load is Low - Volume is important: Load is 60 to 65% of 1 max repetition

# or Reps is High: 8 to 12 reps - With good form in all sets

High # of exercises in a circuit: 8 to 10 stations in a circuit

High # of sets in a circuit: 3 to 4 circuits

Rest Interval between exercises: 60 to 120 seconds

Rest Interval between circuits: 2 minutes

Frequency: 3 sessions per week

Tempo or speed of execution is moderate

#### **Torso/Trunk Core Training - "the power zone", work all three planes:**

*(side to side, front to back, rotational)*

Lower Body Training - single leg training will produce excellent results without extreme loads (gluteus, hamstring, quadriceps, calves)

Upper Body Training - extensive use of dumbbells (shoulders, back, chest, arms)

#### **Muscle Hypertrophy Phase**

The goal is to increase muscle mass or size. Each set is completed to exhaustion or a degree of exhaustion. Many times the last rep will not be able to be completed due to exhaustion. Focus is on doing each set to exhaustion this sets up a chemical change in the muscle and over time will increase the size of the muscle.

#### **Training Parameters of Work**

Duration of Hypertrophy Phase: 4 to 6 weeks

Load is Moderate: 70 to 80 % of 1 max repetition

# of Exercises is Moderate: 6 to 9 exercises

# of Repetitions is Moderate: 8 to 10 reps (If failure to achieve 8th rep on 3rd set weight used is perfect)

# of Sets: 3 + 2 super sets

Rest Interval: 60 to 90 seconds

Tempo or Speed of Execution: Slow - to extend the training stimulus

Frequency 3 to 4 sessions per week (2 x week lower & 2 week upper body)

#### **Maximum Strength Phase**

The main objective is to develop the highest level of force, to become significantly stronger. the athlete's goal is to learn to synchronize the muscles involved in the movement (neural training). Using the maximum load method results in higher fast twitch muscle fiber recruitment. The training phase opens the door to plyometric training. You must be strong before beginning any kind of plyometric program.

#### **Training Parameters of Work**

Duration of Maximum Strength Phase: 1 to 2 months

Load is High: 85 to 100% of 1 max repetition

# of Exercises is Moderate: 3 to 5 exercises (all opposing muscles)

# of Repetitions is Low: 3 to 5 reps  
# of Sets: 3 to 4 sets  
Rest Interval: 3 to 6 minutes  
Tempo or Speed of Execution: Fast as possible  
Frequency 3 sessions per week

3 Training Days per week: Day 1 = Heavy (90 to 100%) , Day 2 =Light (80 to 85%), Day 3 = Medium (85 to 90%)

Types of Training Sets:

Pyramid (varied) - 10 x 50%, 8 x 65%, 6 x 80%, 4 x 85%, 2 x 90% = 30 reps total

Flat Pyramid - 5 x 65%, 3 x 75%, 3 x 80%, 3 x 85%, 3 x 90%, 3 x 92% = 20 reps total

### **Conversion to Power Phase**

What is Speed?

The main objective of the conversion phase is to synthesize strength gains into competitive sport-specific power that forms the foundation for advancement in athletic performance. An athlete can be very strong, with a large muscle mass, yet be unable to display power due to an inability to contract strong muscles in a very short time. The advantage of explosive, high velocity power training is that it "trains" the nervous system. Increases in performance can be based on neural changes that help the individual muscles achieve greater performance capability.

During the conversion phase athletes need to be energy conscious, using most of their energy for technical and tactical training and much less for power training. Coaches must plan training with the lowest number of exercises that closely relate to the skill. The program must be performed quickly and explosively to recruit the highest number of motor units at the highest rate of contraction.

Speed of performance is paramount when using the ballistic method. Each repetition should start dynamically with the athlete attempting to increase the speed constantly as the release or the end point of the exercise approaches.

Exercises should be performed only as long as quickness is possible. Repetitions must stop the moment speed declines.

#### **Training Parameters of Work**

Duration of Power Conversion Phase: 1 to 2 months

Load is High: 30 to 80% of 1 max repetition (Cyclic= 30 to 50%, Acyclic=50-80%)

# of Exercises is Moderate: 2 to 4 exercises (use combinations of weights and plyometrics)

# of Repetitions is Low: 4 to 6 reps

# of Sets 3 to 6 sets

Rest Interval: 2 to 6 minutes

Tempo or Speed of Execution: Fast as possible

Frequency 2 to 3 sessions per week

### ***STRENGTH & MUSCLE BALANCE CHECKS***

#### **Muscle Soreness and Recovery**

The prevention of muscle soreness can take several methods, from training to medication. The most important preventive tool for the coach to consider is progressive increase in load in training. Stretching is strongly recommended at the end of any training session. After extensive muscle contraction, typical of strength training, muscles are slightly shorter. It takes around two hours for them to return to resting length. Five to ten minutes of stretching helps the muscle return to resting length sooner, optimizing biochemical exchanges at the muscle fiber level. Stretching also seems to ease muscle spasms.

Ingesting 1000 mg of vitamin C per day may prevent or at least reduce muscle soreness. Similar reports seem to result from the ingestion of vitamin E. Athletes exposed to heavy loads in training require more protein and carbohydrates. There is a one and a half hour window, after exercise, where the body super-compensates and restores its muscle glycogen stores at three times the normal rate.

Approximately 50% of an athlete's final performance depends on the ability to recover. If recovery techniques are inadequate, adaptation may not be achieved.

Coaches must be aware of the factors that contribute to recovery. No single factor affects the body by itself, it is the combination of many factors, all at varying degrees, that contribute to the recovery process.

### **Suggested Recovery Times After Exhaustive Strength Training**

Restoration of ATP/CP3 to 5 minutes

Restoration of Muscle Glycogen

After prolonged exercise: 10 to 48 hours

After Intermittent Exercise: 24 hours

Removal of Lactic Acid from muscle and blood: 1-2 hours

Restoration of vitamins and enzymes: 24 hours

Recovery from over taxing strength training: 2 - 3 days

Repayment of alactic acid oxygen debt: 5 minutes

Repayment of lactic acid oxygen debt: 30 to 60 minutes

*For further reading in the subject:*

"Periodization Training for Sports - Programs for Peak Strength in 35 Sports" by Tudor Bompa, PhD, Human Kinetics. ,

"Power Training" by Dr. Michael Colgan, Apple Publishing.