

## Physical Fitness for Sport

(referenced from "Martens Successful Coaching")

Athletes must be fit to play well and to avoid injury. I tell people, "Don't play sports to get in shape, get in shape to play sports!" One of your major coaching responsibilities is to help your athletes achieve the levels of energy fitness and muscular fitness demanded by your sport.

**Energy fitness** involves storing and using fuels to power muscle contractions. It also involves the development of important supply and support systems, including the respiratory, cardiovascular, and endocrine (hormonal) systems. While others speak of aerobic or cardiovascular training. I use the term energy fitness to describe the training of specific aerobic and anaerobic energy systems and to focus on how such training enhances the muscles ability to use the body's available energy.

**Muscular fitness** encompasses flexibility, strength, muscle endurance, power and speed. It also involves the nervous system, which controls contractions, and so cannot be separated from neuromuscular (nerve and muscle) or training. for skill, strength, muscular endurance and power.

I will begin by examining the warm-up, go on to energy and then muscular fitness, and conclude with a discussion of the cool-down. I will use examples to teach you how to develop training programs for specific types of sports and discuss the problems of over-training.

**Warm-Up.** You should begin each training session with- a warm-up designed specifically for your sport. In low-energy, high-skill sports such as archery or pistol shooting, the warm-up should include stretching and skill rehearsal. In high-energy sports such as swimming the warm-up should raise the respiratory and heart rates and body temperature and involve stretching and technique rehearsal. Adequate warm-up is an essential part of injury prevention because it decreases the incidence of strains and sprains. And before competition, warm-up is a good time for athletes to review and practice important psychological skills (imagery, relaxation, concentration) and to review their strategies for the event.

The stretching part of a warm-up reduces soreness and the risk of injury and increases the range of motion around joints. Try to begin the warm-up on a comfortable surface and have athletes slowly stretch the lower back, hamstrings and other muscles susceptible to soreness or injury. Don't use old-fashioned bobbing and bouncing movements to stretch -they cause a reflex muscle contraction that makes stretching difficult and risky. Athletes should reach until they feel slight discomfort, hold the position for five counts, then relax. Another effective approach is the contract-relax technique: Athletes stretch, hold, and relax, then they contract the muscle for several counts and immediately stretch it again.

Five minutes of easy stretching is usually adequate. Players should stretch any muscles that get sore or are more easily injured when stiff and cold. Warm muscles are easier to stretch, so if you want to stress improved flexibility (as in gymnastics, wrestling, or even running), do additional stretching after some warm-up.

After stretching go on to callisthenics, beginning with slower movements before doing vigorous ones like jumping jacks to increase respiration, circulation, and body temperature. After 5 minutes your athletes should be warmed up enough to practice skills. Start out easy; don't contact drills or violent moves until players are well warmed up.

### Energy Fitness

Energy fitness is the body's ability to store and use fuels efficiently to power particular muscle contractions. It also includes important adaptations in the supply and support

systems (respiration, cardiovascular, and hormonal) that deliver oxygen and fuels to muscles and carry off carbon dioxide and other wastes. As a coach you should know the major energy sources and pathways used in your sport and how to help athletes achieve the energy fitness they need to compete successfully. You should understand how muscles use the energy available to them and how inefficient energy use hastens fatigue. This is important, as you will see, because the demands of different sports cause muscles to use energy differently. By matching training regimens to the energy demands of your sport, you will help your athletes meet these differing demands most effectively.

### **Energy Pathways**

The energy that muscles use to contract comes from two systems. One is called aerobic (meaning "with oxygen") and the other anaerobic ("without oxygen"). Which system the body uses- depends on several factors, including the availability of oxygen and the intensity and duration of activity. The anaerobic energy system has two parts:

- short term (under 30 seconds), and
- the lactate energy system (30 to 90-seconds).

Anaerobic energy sources are used at the beginning of exercise, before respiration and circulation adjust to the physical effort and being supplying oxygen to the- muscles, and when energy demands exceed the body's ability to generate aerobic energy. During the short-term anaerobic phase, energy comes from limited energy supplies stored in the muscles. In the lactate system, energy comes from stored muscle glycogen. Aerobic energy sources are used during longer, steady-paced activities, such as running. Aerobic energy comes from the oxidation (burning) of fat and carbohydrate. If the activity becomes so intense that the energy demands exceed the aerobic or oxidative systems ability to provide oxygen, additional energy for muscle contractions then comes from the anaerobic or nonoxidative breakdown of muscle glycogen. The product of glycogen use is lactic acid.

Fuelling muscle anaerobically is far less efficient than fuelling it aerobically. For example, when muscle glycogen is burned aerobically it produces 38 units of energy; used anaerobically it produces only 2 units. The anaerobic pathway also produces more lactic acid, and excess lactic acid interferes with the muscle's ability to contract and hinders energy production, causing fatigue and poor performance.

When athletes exercise at a level of intensity that demands anaerobic energy production, then quickly reduce muscle energy stores, produce excess lactic acid and hasten fatigue. If they continue too long, the inefficient anaerobic energy pathway depletes muscle glycogen and sours the muscle with acidic by-products. The athlete then must slow down or stop the activity in order to replenish energy stores, remove acidic by-products, and allow the muscle to recover. Fortunately, muscles can be trained, even at higher intensities, to work much more efficiently.

### **Energy Training**

It may be helpful to think of energy training like building a pyramid. As you can see, the training pyramid is constructed on a solid aerobic foundation.

#### **Aerobic Foundation**

Aerobic fitness - the ability to take in, transport, and use oxygen is necessary for athletes in every sport.

Training for aerobic fitness help toughen ligaments, tendons, and connective tissue and reduces the risk of injury, while developing the toughness and endurance needed for more intense training. It lays the foundation upon which all future- practices and performances- are built. Even in football (predominantly and anaerobic sport because the average play lasts but a few seconds), aerobic fitness helps athletes-recover faster between plays and practice longer before fatigue sets in.