



Golden Hills

Orthopedic and Sports Physical Therapy

j o u r n a l

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Patient Tips

Effective Training

- Develop program that is enjoyable and fits your lifestyle and fitness goals
- Simplify your workouts and practice skills needed in your sport
- Avoid overtraining
- Vary your workout type, pace and intensity
- Be Flexible; don't get discouraged if you miss a training day
- Set realistic goals to avoid discouragement and possible injury
- Be consistent; integrate workouts into your lifestyle and do them on a regular basis
- Be patient; it takes time and consistency to build up fitness and performance
- Maintain proper nutrition
- Always use proper equipment that is in good working condition

Part II: **A Guide to Exercise Training and Conditioning**

The May issue of *Golden Hills Journal* was the first in a two-issue series on the importance of training and conditioning. In May, we focused on the foundational concepts of training and conditioning, as well as the four characteristics of physical performance: strength, endurance, speed and coordination. This month, we delve into strength training, anaerobic conditioning and aerobic conditioning.

Strength Training

In general, strength is simply the force that can be generated when a muscle is contracted. Muscular power is a component of strength and has become an important goal of strength training programs. The strength of a muscle depends on the joint range of motion (ROM) in which the muscle acts. The rotary action of a muscle around a joint axis that produces force is referred to as torque. Muscular power is created by the torque generated and the speed of a muscular contraction.

Another component of strength training is the acquisition of muscular endurance, which is the capacity of a muscle group(s) to perform repeated contractions against a resistance. Depending on his or her sport or activity, the athlete or patient requires varying degrees of endurance training for muscles that require force generation over protracted periods.

Athletes and non-athlete patients can train for muscular endurance in various ways, including circuit resistance training (CRT), high-repetition progressive resistance exercise (PRE) or speed-specific isokinetic exercise to reduce the fatigability of muscles. Muscular endurance exercise induces aerobic and anaerobic metabolic system adaptations within the muscle, with the goal of maintaining forceful contractions over prolonged periods of time.

For strength adaptations to occur within muscle tissue, the overload principle must be applied to the strength training program. The overload principle is the process of overloading a muscle or muscle group(s) with a resistance that exceeds the threshold by which adaptive changes occur within the muscle fiber. Along with overload, any training and/or conditioning program must follow an agenda for incorporating intensity and volume (frequency and duration) and mode of exercise.

Today's athletes devote extensive time to weight-training programs engineered to develop functional strength specific to their sport.

For non-athletes, additional benefits of strength training include improved body image, increased energy levels, lower stress and improved long-term physical health.

A Guide to Exercise Training and Conditioning (Continued)

Modes of Strength Training

Isometric

Isometric contraction is classified as static, because the length of the muscle does not change in response to the generation of force within the muscle against an externally applied resistive force.

Isotonic

Isotonic training involves exercise at a fixed resistance with variable angular velocity occurring throughout the ROM. This type of exercise is different from isometric exercise in that the force generated within the muscle overcomes the external counterresistance, thus causing the muscle fibers to change their length.

Isokinetic

Isokinetic training is speed-specified exercise with accommodating resistance throughout the ROM. Isokinetic exercise permits the trainee to train at fast, intermediate or slow angular velocities, with a counterresistive force matching the force exerted by the trainee.

Strength Training Programs

- **Progressive Resistance Training (PRE)** is performed at a percentage of the maximal amount of resistance in sets of 10 repetitions. This form of strength training focuses mainly on isotonic and includes free weights, resistive tubing, circuit devices and cables/pulleys.
- **Circuit Resistance Training (CRE)** is used mainly by endurance athletes who are interested in gaining muscular strength and endurance. CRT involves protracted periods of repeated muscle contractions followed by short periods of recovery.
- **Plyometric Training:** Uses the trainee's body mass as well as the force of gravity for resistance.

- **Isokinetic Training:** Useful for speed-specific strength training.

Anaerobic Conditioning

Anaerobic conditioning is important for athletes who require near maximal, quick bursts of power such as sprinters, rowers and soccer players. Anaerobic conditioning results in the enhanced efficiency of anaerobic energy during exercise. This type of conditioning uses high-energy anaerobic pathways (ATP-CP) and glycolysis for generating the energy necessary to power skeletal muscle contractions.

For non-athletes, anaerobic conditioning can build strength and burn more calories than longer, low-intensity workouts, but patients should be warned of a potentially higher risk of injury.

Anaerobic Conditioning Programs

- **Sprint Training:** Athletes who compete in sports that are acyclic and use the immediate energy pathway will benefit from exercises that require explosive power or sprinting.
- **Interval Training:** Interval training is cyclic, incorporating high-intensity exercise for short or moderate distances or durations. Modes can include running on a track, pedaling a stationary cycle and swimming.
- **Isokinetic Training:** Several companies produce isokinetic equipment that provides isokinetic resistance.

Aerobic Conditioning

The term "aerobic" implies that oxygen is used to generate power for endurance exercise. Aerobic conditioning involves submaximal endurance training for mainly

cyclical activities with durations exceeding three minutes. Examples include distance training for running, cycling, rowing, stair climbing, cross-country skiing and aerobics.

Aerobic conditioning programs are incredibly beneficial for the non-athlete, as they can enhance respiratory function, increase metabolism and energy levels, and establish a basic level of fitness and endurance.

Aerobic Conditioning Programs

- **Over-Distance Training** is performed purely for endurance benefits by athletes who require an aerobic base for long-distance events.
- **Steady-Rate or Tempo Training** is used as an adjunct to over-distance and interval training. Oxygen consumption is constant and proportional to the submaximal workload.
- **Fartlek Training:** "Fartlek" is a Swedish term meaning "speed play" and involves continuous aerobic exercise with interval periods of anaerobic bursts.

Training produces many biophysical adaptations that enable the athlete and non-athlete alike to meet and enhance physical performance and realize a number of long-term health benefits. Central adaptations include cardiac output, stroke volume and heart rate, blood pressure and flow, and ventilation. Peripheral adaptations include atriovenous oxygen difference and oxygen consumption, hematologic adaptations, thermoregulation and muscle fiber changes.

Contact Golden Hills today at **(408) 274-0888** to find out how we can help your patients establish an effective training and conditioning program.