



# Conditioning Fundamentals

## The Role of Progressive Overload in Sports Conditioning

Ashley Kavanaugh

**I**n order to make the most out of any training program it is important to have a well designed plan that follows some basic principles of periodization. One major component in all training programs is the principle of progressive overload (2). Through the use of progressive overload, an athlete builds upon their work capacity, strength, and conditioning level in a systematic and logical way. This practice promotes maximized workout potential in a manner that is safe for the individual.

### The Science Behind Progressive Overload

The principle of progressive overload suggests progressively placing greater-than-normal demands on the exercising musculature (1). This is required for a training adaptation to take place. Without overload, there is no adaptation by the body. Neuromuscular adaptations occurs first, followed by increases in muscle and connective tissue strength, and bone mass. Proper conditioning methods will lead to physiological advancements as well. Depending on

the training goals, improvements in lactic acid tolerance, lactate threshold, maximal aerobic power, and a variety of cardiovascular functions could be appropriate responses (1).

Progressive overload involves applying stimulus. The human body's reaction to a training stimulus can be described as the General Adaptation Syndrome (GAS). The GAS concept further explains the need for progressive overload in a training environment. Three stages are involved in the response to stress; alarm, resistance, and exhaustion (1). The body undergoes the alarm phase when a new or intense stress is placed on the body. An athlete may experience extreme soreness or a temporary drop in performance during this time. The resistance phase follows, and results in the body adapting to the stimulus and returning to normal. Again, neurological adaptations are the first to take place, while muscular adaptations appear later. The exhaustion phase results if the training stress persists for too long. Overtraining, mental fatigue, and other symptoms may accompany

this phase as well (1). It is ideal to avoid the exhaustion phase, and is possible with proper periodization and adequate recovery. Through the use of periodization, an athlete can continuously challenge the body with progressive overload, while avoiding plateaus or detriments to training.

### Needs Analysis

Before one can start to assess how to properly apply overload to our training, we must first consider the sporting needs. A needs analysis is the first step to a successful and effective training program. In terms of conditioning, there are some important factors to consider.

### Energy System Usage

The body runs on three energy systems; phosphagen, glycolytic, and oxidative/aerobic. The energy system in use is primarily determined by the intensity of exercise and secondly by the exercise duration (1). The intensity and duration at which you train should closely match that of your sport.

The phosphagen system provides energy during short, high intensity activities, ranging from five to ten seconds and is active at the start of any exercise. The glycolytic system is the primary energy system for moderately intense exercise lasting from 15 seconds to three minutes. The oxidative or aerobic energy system is used at rest, during recovery, and for low-intensity activities longer than three minutes. Still, it is important to remember that no single energy system works alone, rather they overlap and alternate (1).

### Work to Rest Ratio of the Sport

The sport's work to rest ratio is extremely important in conditioning as well. The proper metabolic system must be targeted to improve athletic performance. First, you must identify which energy system is mostly used in your sport. To do this, first consider what range of intensity best suits your activity. Secondly, decide the length of the activity bouts and recovery periods. Once you have an idea of your sport's intensity and work to rest ratio, you are on your way to a sound conditioning program.

### Specificity

The adaptations that occur with training are specific to the training performed. Your needs analysis must look at what are the attributes of the movements that encompass the sport (e.g. strength, power, speed, endurance, etc) and what muscles are involved in these movements. For example, if your sport involves multiple short duration sprints, then to benefit your performance you must train lower body power and perform interval training as well.

Depending on where you are in your training cycle (e.g. in-season, off-season,

etc), you should condition according to the mode of your sport. For example, a basketball player will condition mostly through a variety of running and jumping drills. A rower, on the other hand, will spend more time erging or rowing on the water. Cross-training is an exception, and involves training using a different mode of exercise than that of one's sport. Cross training can be used to maintain general fitness while aiding in recovery (1). For the most part, you will want to train close to the conditions of your sport.

### Application of Progressive Overload

As an athlete, you may have tried, or have been tempted to adopt the training practices of highly successful or well known athletes. However, you would be better served by following a program based on your individual needs and physical limitations (1). This way, you are working at an optimal level, which you can build upon safely and effectively. To enhance athletic performance you must apply the principle of progressive overload to some extent in your training. The use of progressive overload in a periodized program involves implementing variations in training specificity, frequency, duration, intensity, and load.

Applying progressive overload is appropriate after configuring a needs analysis. A periodization scheme will shift training priorities from non-sport specific activities of high volume and low intensity to sport-specific activities of low volume and high intensity (1). In other words, athletes beginning a conditioning program must develop a fitness base with longer, less intense workouts. Training will progress to more sport

specific, shorter, intense activities. This overload will take place over the course of many weeks.

The following are ways to add progressive overload to your conditioning by manipulating the variables of specificity, frequency, duration, intensity, and load.

### Exercise Variation

Implementing different modes of exercises periodically will challenge your body in new ways, while taking stress off more frequently used muscles and joints (1).

### Exercise Frequency

Frequency of training will depend on exercise intensity, duration, the athlete's training status, and time of season (1). The number of daily or weekly training sessions depends on all these factors, and can be manipulated accordingly.

### Exercise Duration and Intensity

The length of time or duration of the training session can be varied as well. Exercise intensity will determine exercise duration. Generally, the more intense a workout the shorter the length and vice versa. Exercise intensity should be closely monitored to ensure the proper amount of overload is applied.

### Load

The load or intensity of the exercises will depend on the goals of the current training program. If the goal is strength, then the load assignment will be high. If the goal is endurance then the load will be lower. As the load increases, the number of repetitions performed decreases.

### Summary

All athletes want to make the most gains from their training as possible. To do this, the principle of progressive overload must be used. Progressive overload involves systematically applying a training stimulus that forces the body to adapt and grow. Adapting conditioning workouts involves manipulating specificity, frequency, duration, and intensity variables. When we neglect proper progression during training, certain unwanted consequences may result. These consequences include overtraining symptoms along with decreased performance. The progressive overload principle is a way to safely make training gains. So, be aware of your training stimulus and how your body is recovering from training. Major performance gains take time and dedication, but are possible if you consistently progress your workouts.

### Reference

1. Baechle TR, Earle RW. (Eds.). (2000). *Essentials of Strength Training and Conditioning (2nd ed.)*. Champaign, IL: Human Kinetics.
2. Pearson D, Faigenbaum A, Conley M, Kraemer WJ. (2000). The National Strength and Conditioning Association's Basic Guidelines for the Resistance Training of Athletes. *Strength and Conditioning Journal*, 22(4): 14 – 27.

### About the Author

*Ashley Kavanaugh is a fourth year exercise science student at the University of Dayton in Dayton, Ohio. She recently completed a strength and conditioning internship at the US Olympic Training in Lake Placid, NY. She has also interned at the NSCA Human Performance Center. Ashley has passed the NSCA CSCS exam and holds a USAW Club Coach certification. Currently at UD, she is the strength coach for women's rowing, assisting with track and field, basketball, and soccer teams. Ashley can be reached at ashley.kavanaugh@hotmail.com.*

