

Periodized Training for the Strength/Power Athlete

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The use of periodized training has been reported to go back as far as the ancient Olympic games. Its basic premise is that through manipulating training volume and intensity, in conjunction with appropriately timed short unloading phases, the athlete can reach peak condition at the appropriate time, and minimize the risk for overtraining. This article will address the background of periodization, its efficacy and various models of periodized training, with the primary emphasis on the strength/power athlete.

Basic Principles of Periodization

The basic principle of periodization is a shift from an emphasis of high volume (exercises x sets x repetitions) and low intensity (% of maximum effort) training to low volume and high intensity training. The training year is divided into distinct phases known as mesocycles. Each mesocycle relates to a change in the volume and intensity of training, and may last for 2 – 3 months depending upon the athlete. Typically each mesocycle reflects a specific training emphasis for that phase of training.

The initial mesocycle is called the preparatory or hypertrophy phase and consists of high volume and low intensity training. It is designed to primarily increase muscle mass and muscle endurance, and to prepare the athlete for more advanced training during the later stages of training. The next two mesocycles are generally referred to as the strength and strength/power phases, respectively. In these mesocycles training intensity increases while training volume is reduced. The final mesocycle of the training year is the peaking phase. During this training phase the athlete prepares for a single contest by further reducing training volume and increasing intensity.

It is not uncommon to have short training cycles called microcycles that help transition from mesocycle to mesocycle. These microcycles are generally 1 – 2 weeks in duration and provide a change to the normal training routine allowing the athletes to avoid staleness and aid in recovery. Table 1 provides an example of training manipulations across the various mesocycles in the strength/power athlete.

Mesocycle	Sets	Repetitions	% 1-RM
Hypertrophy	3 – 5	8 – 12	60 – 75%
Strength	3 – 5	6 – 8	80 – 85%
Strength/Power	3 – 5	4 – 6	85 – 90%
Peaking	3 – 5	2 – 4	>90%

Table 1: Volume and intensity in a periodized strength training program

In athletes that participate in a sport placing importance on an entire season (i.e. football, basketball), peak condition needs to be achieved by the onset of the competitive year, and maintained throughout the duration of the season. These athletes generally have a short peaking phase preceding training camp or the start of the season. However, during the season both training intensity and volume are manipulated to reflect the importance that is placed on practicing sport specific skills. During this training phase exercise intensity is reduced to levels similar to those used during the strength phase, while training volume is lowered by reducing the number of assistance exercises. Inseason training is typically called the maintenance phase and is generally performed at a reduced frequency of training as well.

Efficacy of Periodization

Increases in strength have been shown in both periodized and nonperiodized resistance training programs. However, strength improvements do appear to be greater as a result of periodized training³. The upper range for strength improvement in the 1RM bench press is reported to be about 17% in nonperiodized training programs and 29% in periodized training programs, while the upper range for 1RM squat is 32% in nonperiodized and 48% in periodized training^{1,4,6,7,8}. In addition, periodized resistance training programs appear to be superior than nonperiodized training programs in generating improvements in vertical jump performance^{5,6}.

These studies provide evidence that periodized resistance training is more effective than nonperiodized training in eliciting strength and motor performance improvements. However, this advantage may be largely dependent upon the training status of the individual². The magnitude and rate of strength increases are much greater in untrained individuals than in trained individuals, therefore in consideration of the rapid strength increases seen in novice lifters, periodized training may not be necessary until a certain strength base has been established.

Models of Periodization

The periodization model that has been the focus of discussion until now consists of uniform changes in training intensity and volume that remain relatively constant throughout each mesocycle. This linear model of periodized training is the classic form for designing most periodized training programs. However, nonlinear or undulating periodization models are also becoming popular. This model of periodization varies the volume and intensity of training from workout to workout (see Table 2). Light, moderate and heavy intensities of training can be alter-

nated during each week of training. Nonlinear training appears to be as effective as traditional or linear models of periodization. In sports that have several games or competitions in a given week, nonlinear training may be preferable to use because of the ability to use relatively light training intensities on days proceeding or on days of competition. High intensity training will still be used, but at a more appropriate time of the week.

The following are examples of periodized training programs for a strength/power athlete playing a team sport, and a strength/power athlete involved in a sport placing primary importance on an isolated competition (i.e. National meet) during the training year. Each program should be considered as only an example and a possible guideline in developing a periodized training program to meet your needs or the needs of your athletes. It is important to remember that the entire athletic conditioning program needs to be considered during the development of the periodization program, and not just the resistance training component of the program.

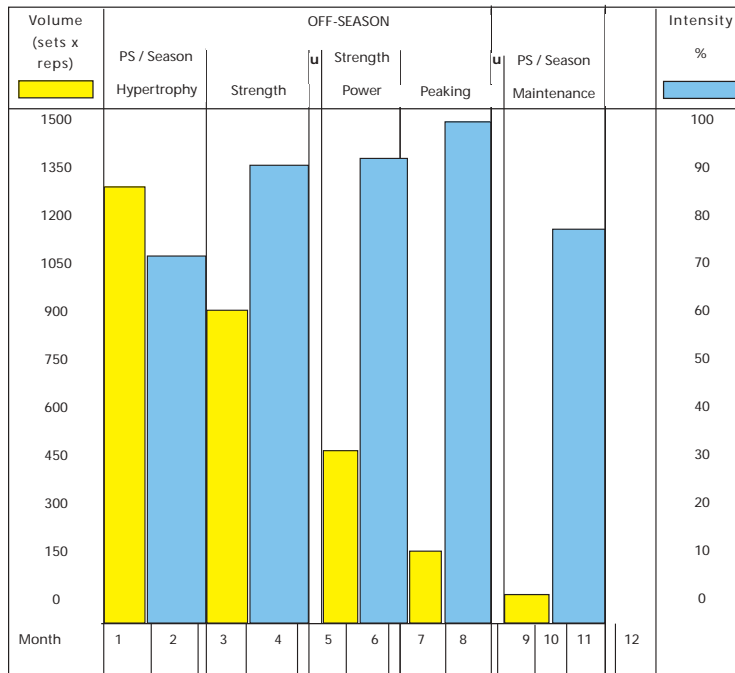
Periodized Training Program for a Strength/Power Athlete in a Team Sport

An example of an annual periodized training program for a strength/power athlete playing a team sport (i.e. football) can be seen in **Figure 1**. The initial mesocycle is the preparatory or hypertrophy period in which the primary objective of the resistance training program is to prepare the athlete for more strenuous training that will be experienced in the subsequent training phases. In addition, the intensity and volume of training during this phase will also be conducive for those athletes needing to add additional muscle mass. During this training phase the athlete may also perform some additional form of conditioning

Table 2: The linear model of periodized training

	Sets	Repetitions	Rest Between Sets	Training Goal
Day 1	3 – 5	8 – 10 RM	2 min	Strength
Day 2	4 – 5	3 – 5 RM	3 – 4 min	Strength/ power
Day 2	3 – 4	12 – 15	1 min	Hypertrophy

Figure 1: An annual periodized training program for a strength/power athlete playing for a team sport.



This program assumes that there is no spring football.

u = unloading week

PS = Preseason

activity (i.e., jogging, cycling, swimming, recreational sport) 2 - 3 days per week to maintain their cardiovascular endurance. At the conclusion of this mesocycle there may be an unloading phase that significantly reduces the intensity and volume of training to prepare the body for the next phase of training.

The next mesocycle is the strength phase. During this training phase training intensity is increased, while the training volume is reduced. The primary emphasis during this mesocycle is focused on increasing maximal strength. In addition, the cardiovascular conditioning program will continue. To allow the athlete to adequately recover from this training cycle another unloading phase may be added.

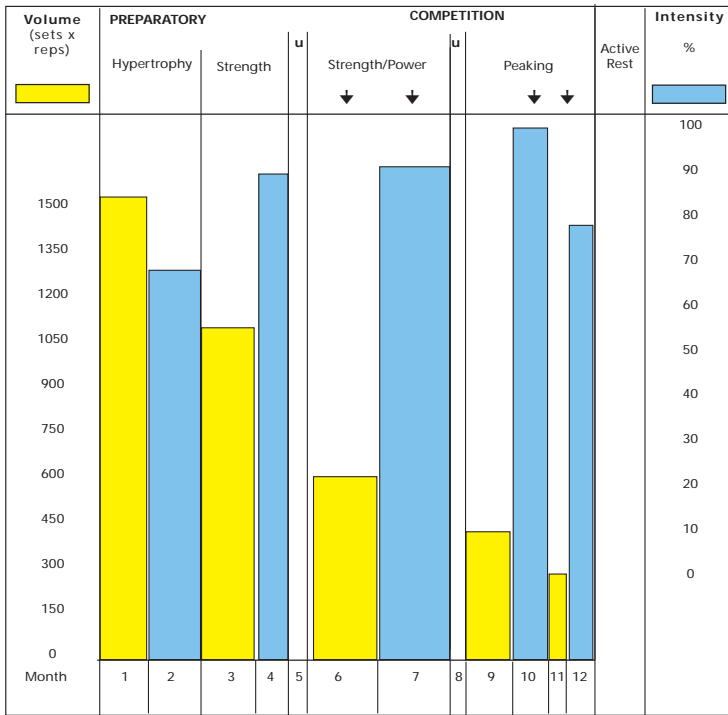
The next mesocycle will be the strength/power phase. During this training cycle the Olympic exercises (i.e. power cleans, push press, high pulls), if not already part of the training program, may be included. The exercises used will have a greater specificity to the movements on the field of play, and provide a greater opportunity for strength carryover. The intensity of exercise will be elevated further, while the training volume (related to the reduced number of repetitions, as the number of sets per exercise might remain constant) is decreased. During this training phase incorporation of plyometric exercises may also be included into the training program. In addition, sport specific conditioning,

agility and speed training can also be integrated into the 2 - 3 day per week conditioning program.

The next phase of training that precedes training camp is of shorter duration (four to six weeks) and is designed to bring the athlete to both peak strength and condition for the start of the football season. During this peaking phase training intensity is further elevated, while the volume of resistance training is again reduced. This is accomplished by reducing the number of assistance exercises in the resistance training program. By this phase of training the athlete should be primarily concentrating on getting into the proper physiological condition to play football. Emphasis in the conditioning program will be on anaerobic training (i.e. intervals, both long and short sprints, and agility exercises). The plyometric exercises incorporated into the previous mesocycle should still be included in the training program.

As the athlete reports to training camp this initiates the beginning of the pre-season period, which will last until the start of the regular season. During this period and for the remainder of the competitive season, the resistance training program may be reduced to a two-day per week maintenance program. The maintenance phase generally incorporates the core exercises with several assistance exercises.

Figure 2: An annual periodized training program for a strength/power athlete preparing to peak for a single event



u = unloading week

☆* = Preseason

Periodized Training Program for a Strength/Power Athlete Preparing for a Specific Event

An example of an annual periodized training program for a strength/power athlete preparing to peak for a single event can be seen in **Figure 2**. In the previous example we saw how in an athlete participating in a sport that has a well-defined off-season, pre-season and season, dividing the year into precise mesocycles is easily accomplished. However, in preparing an athlete to peak for a specific event, which often occurs at the end of the competitive season, precise control of the training variables is required in order to have the athlete peak at the desired time. Unlike the team sport in which there is some room for maneuverability, a mistake in the training prescription for an athlete preparing for a single competition would result in an undesirable outcome. Either the athlete would not reach peak condition by the time of the contest, or the athlete may peak too early and possibly overtrain in an attempt to maintain that high performance level for an extended period of time.

During the initial phase of training the program is quite similar to what is typically seen for the strength/power athlete participating in a team sport. However, the competitive phase may be quite long with many of the earlier competitions considered being of lesser importance. In this instance the athlete will ‘train’ through those early competitions, preferring instead to peak for the more important competition at the end of the year. During this competition period the major difference between this athlete and the athlete participating in the team sport will be the absence of a maintenance phase. The athlete preparing for a single competition may have several mesocycles occurring during the early to mid-competitive year and then enter a peaking phase to maximize performance prior to the competition.

In many sports there is both an indoor and an outdoor season (i.e. track and field). In this situation there are two competitive seasons, each having a competition that the athlete will primarily focus on. These two competitive seasons would be linked through a short unloading period. The approach to each training cycle would be similar to what was previously described above for an athlete preparing for a single competition. However, if greater importance was placed on the competition during the second cycle then training volume would be higher in the preparatory phase during the first training cycle, and be of shorter duration. Changes in training intensity will be similar during each training cycle.

The challenge of multi-cycle training programs is the reduction in the preparatory phase of training. The higher training intensities performed more frequently during the year places the athlete at a greater risk for overtraining. It is likely that such training programs are best suited for more advanced athletes due to their experience and ability to adapt to this high physical demands.

Summary

The goal of periodization is to maximize the potential of the athlete to reach peak condition by manipulating both training volume and training intensity. Through proper manipulation of these training variables, not only will the athlete peak at the appropriate time, but also the potential risk for overtraining is reduced. The use of periodized training programs has proven to be more advantageous than nonperiodized training, but these benefits may be more relevant for the experienced athlete.

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About the Author

Dr. Hoffman is currently Associate Professor in the Department of Health and Exercise Science at The College of New Jersey in Ewing, New Jersey. Dr. Hoffman has been quite active in 'bridging the gap' between the laboratory and the playing field. Dr. Hoffman is a Fellow of the American College of Sports Medicine and is a former NSCA National Scholarship Award Recipient and currently serves on the Association's Research Committee. Dr. Hoffman was also a recipient of the NSCA's 'Outstanding Junior Investigator Award' in 2000. Dr. Hoffman has also been a Strength and Conditioning Coach at both major college and professional levels. In addition to his academic responsibilities Dr. Hoffman is also on the football coaching staff at The College of New Jersey.