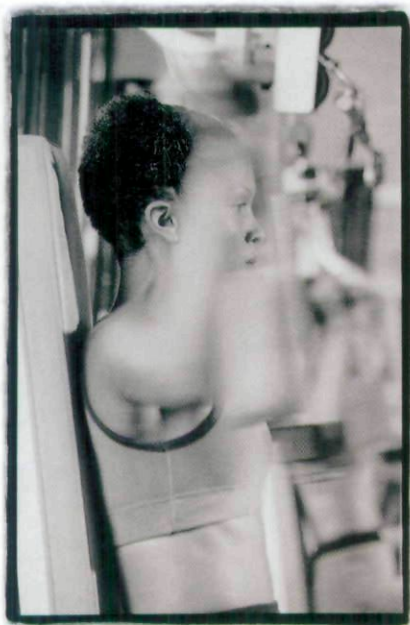


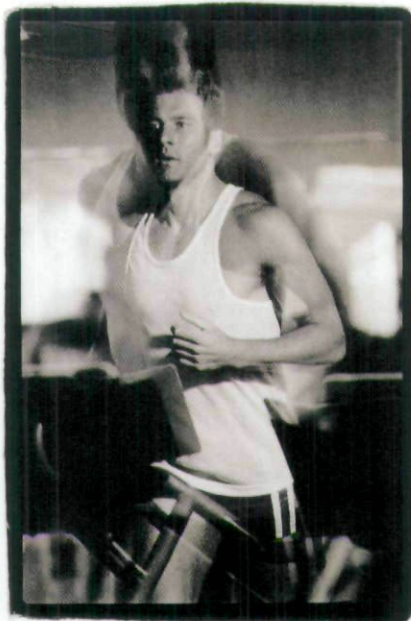
Defining Periodization

Exploring the fundamentals for cycling training phases.



The term **periodization** refers to the systematic manipulation of the acute variables of training over a period that may range from days to years. The original concept was developed in the former Eastern Bloc countries in the late 1950s to optimize athletes' adaptations to resistance training. More important, periodization revolves around the athlete's competitive calendar so that he or she is at a competitive peak for competition.

The basis of periodization is general adaptation syndrome (GAS), which describes three stages that an organism—such as an athlete—goes through when exposed to a novel stress (Seyle 1936). As a new stress is placed on the body (for example, heavy training in the range of 3–5 reps), the muscle first goes through an alarm reaction. During this stage the athlete momentarily gets weaker. But with continued exposure to the stress (successive workouts), the body enters the stage of adaptation. In this stage the body



supercompensates for the stress—such as increasing muscle strength—to better deal with the stress. If the body is continually exposed to the same stress for too long, it may enter the stage of exhaustion, where its adaptation to the stress may actually decline. This may mean that the strength gains the athlete made during the adaptation stage will cease, and stagnation may set in. It may even lead to an actual decline in strength. Although this theory is now considered a simplistic take on the body's response to stress, it does hold true and explains the reason periodization is so important for proper adaptation to strength training.

You must expose the muscle to any one training style for just long enough to reap the benefits but avoid a nosedive of those positive adaptations. At this stage a new training style should be introduced, and the cycle continues. A simplistic take on periodization is the maxim of "everything works, but nothing works forever." Having a large arsenal of training methods to use for short periods and continually cycling them in a systematic order will prevent stagnation and maximize training adaptations.

The three periodization schemes most commonly used by strength coaches, which are the three most extensively researched, are classic strength and power periodization, reverse linear periodization and undulating periodization. Although there are many other more obscure periodization schemes, a discussion including these three will cover the premise behind periodization. Regardless of the exact plan, periodized strength training programs have been shown through research to be significantly more effective than nonperiodized programs for increasing strength, power and athletic performance in both men and women (Kraemer et al. 2003; Marx et al. 2001; Rhea & Alderman 2004; Willoughby 1993).

CLASSIC PERIODIZATION

The name implies that this system is the hallmark periodization scheme most associated with the term *periodization*. In its most general form, classic periodization divides a long-term training period called the **macrocycle** (which typically involves 6 months to 1 year but may be up to 4 years, such as with Olympic athletes) into smaller phases called **mesocycles** (usually lasting several weeks to months), which are also subdivided into weekly **microcycles**. The strength training pro-



gresses over the macrocycle from low resistance (intensity) to high intensity with total volume following the opposite progression, from high to low. A schematic overview of the classic strength and power periodization scheme can be seen in Figure 1.

designed for athletes, the hypertrophy phase may be preceded by what is known as a **general preparedness (GP) phase**. This is especially true if the person being trained is a rank beginner or an athlete who is returning after an off-season where little, if any, training took place.

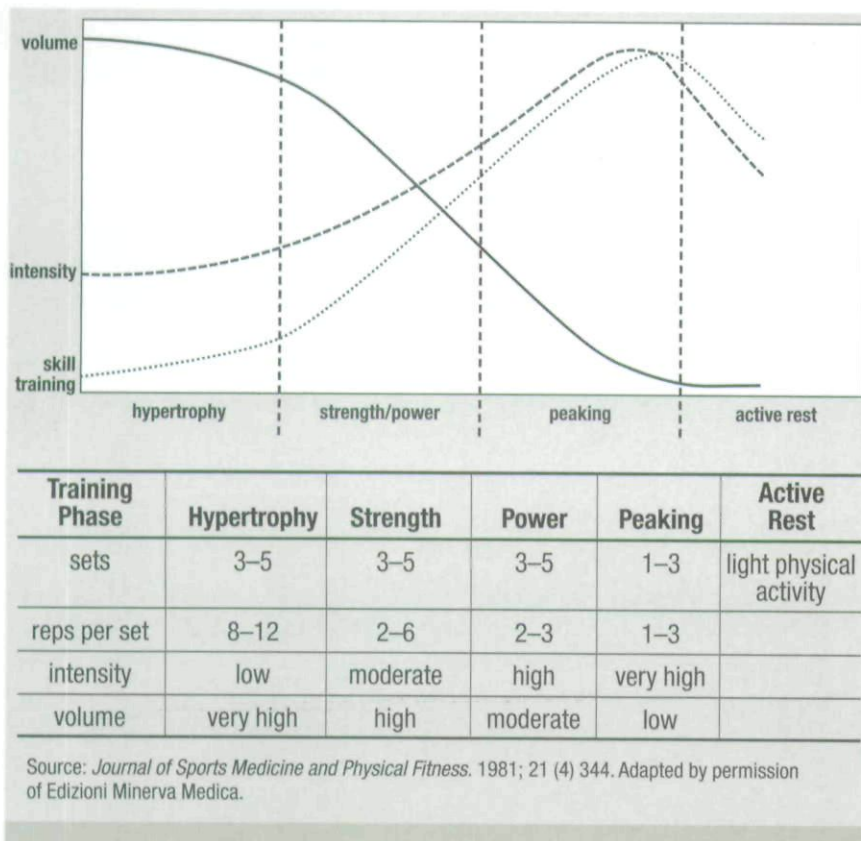


Figure 1. classic strength and power periodization scheme

Figure 1 represents the most common periodization format used for increasing strength and power. The first phase, or mesocycle, is classified as the **hypertrophy phase** and is categorized as being low intensity. Reps are around 8-12 and sometimes as high as 20. It is considered very high in volume because sets are usually in the range of 4-5 for each exercise. The goal of this phase is typically to prepare the athlete for the high-intensity training that is to follow. The muscle hypertrophy experienced in this phase will enhance the gains in strength and power an athlete will make in the later stages. Although this is termed the hypertrophy phase, it should not be confused with a periodized program a bodybuilder would use. Hypertrophy is the main goal in a bodybuilding program, not something an athlete may do only for several months. In some periodized programs

This would provide a means of preparing an athlete for the hypertrophy phase with very low intensity and moderate- to high-volume training.

The next mesocycle is usually the **strength phase**. As the name implies, the major goal during this phase is to maximize muscle strength. This phase is typically moderate to high in intensity with reps in the range of 2-6 and the goal to build up muscle strength. It's somewhat high in volume, with 3 or 4 sets performed per exercise and fewer total exercises performed per muscle group than during the hypertrophy phase.

Following the strength phase is the **power phase**. It is similar to the strength phase in that the intensity is high (reps are in the range of 2-3). The volume is a bit lower; sets usually are about 3 per exercise. The point of this phase is to start trans-

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ferring the strength gains made during the first two phases into more explosive power that serves well for competition.

The final two mesocycles prepare the athlete for competition. The **peaking phase** follows the power phase. It is categorized by low volume (only 1–3 sets per exercise are formed) and very high intensity (reps as low as 1 per set). This phase gets the athlete ready for competition by

first consideration is the fact that the higher-volume training phase may lead to fatigue if followed consecutively for too long. This could be a problem for athletes who must compete at various times throughout the year. The second consideration is the fact that the muscle hypertrophy gained during the hypertrophy phase may not be maintained very well during the later stages,

REVERSE LINEAR PERIODIZATION

Reverse linear periodization takes the classic strength and power periodization scheme and runs it backward. Whereas the goal of the classic periodization model is to maximize an athlete's strength and power, the goal of the reverse linear model is to maximize muscle hypertrophy or endurance strength, depending on the rep range that the program concludes with (8–12 for hypertrophy and 20–30 for endurance strength). Research supports the concept that the reverse linear periodization scheme is more effective for increasing endurance strength than the classic model (Rhea et al. 2003).

In essence, the reverse linear model starts with the power phase, where intensity is very high (2 or 3 reps per set) and volume is low (3 sets per exercise). The peaking phase is usually skipped because the athlete is not preparing for a competition in which power and strength matter. After the athlete follows the power phase for several weeks, the strength phase starts. Again, the strength phase uses moderate to high intensity (2–6 reps per set) and slightly higher volume than the power phase (3 or 4 sets per exercise). The goal of these first two phases is to build the strength and power to optimize gains in mass or endurance strength.

Being able to lift heavier weight for the desired number of reps during the hypertrophy phase can result in significant gains in muscle mass as well as muscle

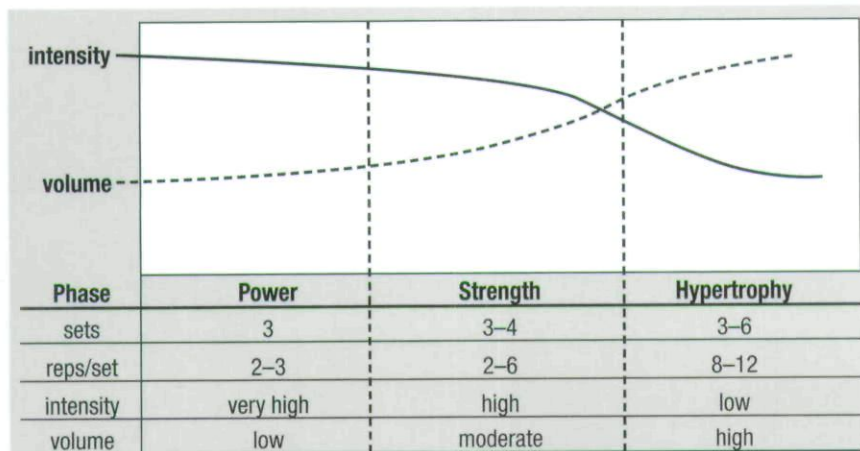


Figure 2. reverse linear periodization scheme for hypertrophy

maximizing strength and power. After this phase, the athlete drops the strength training and undergoes a period of active rest just before competition. The **active rest** phase is categorized by activity other than strength training, such as swimming, hiking or sport activities like basketball and tennis. This phase usually lasts for only about 1–2 weeks before a competition to allow the body to recover from all the strenuous training so that it can perform at its best. After competition, this phase may actually continue for several weeks before the periodized training scheme starts again. For this reason, the active rest phase is often referred to as the **transition phase**. Most strength experts using the classic strength and power periodization program will continue the mesocycle phases for anywhere from 3 weeks to 3 months. However, a compressed version of this program would involve changing the phases (hence the intensity and volume) every week. Then the cycle repeats itself.

Although classic strength periodization schemes can allow for adaptations in strength training, some issues need to be considered with these models. The

where volume gets considerably low. This could be a problem for bodybuilders and other athletes who are concerned about muscle mass. Therefore, other periodized schemes have been developed and tested in the gym as well as in the lab.

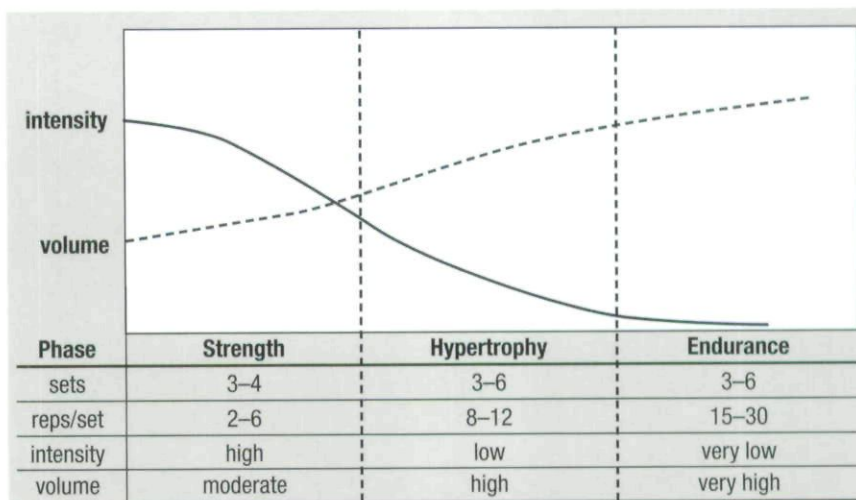


Figure 3. reverse linear periodization scheme for endurance strength

endurance. The hypertrophy stage comes last in the program and involves lower intensity (8–12 reps per set) and high volume, which is the best prescription for building muscle mass. This stage is a good systematic approach to gaining muscle mass, which makes it a smart periodized plan for bodybuilders. See Figure 2 for a sample reverse linear periodization scheme for muscle hypertrophy.

workout on Monday, the endurance strength workout on Wednesday, and the hypertrophy workout on Friday. The following week the lifter may train the endurance strength workout on Monday, the hypertrophy workout on Wednesday, and the strength workout on Friday. If the lifter trained the upper body on Mondays and Thursdays and the lower body on Tuesdays and Fridays, he might then do hyper-

Table 1. undulating workouts

Type of Workout	Sets	Reps	Rest Between Sets
strength workout	3–5	2–4	4–5 min
hypertrophy workout	3–4	8–12	2–3 min
endurance strength workout	3–4	15–30	1–2 min

To make the reverse linear model a better fit for optimizing endurance strength, the power phase can be eliminated. That means it would start with the strength phase, then move to the hypertrophy phase, then move to an endurance phase (where the reps are in the range of 20–30), and finally move to an active rest phase if the athlete is training for a competition. A diagram of this model is shown in Figure 3. As with any periodization scheme, the acute variables can be manipulated within each stage to improve the result of the program. For instance, a reverse linear model can start with reps in the 8–10 range, then progress to the range of 12–15, and end in the range of 20–30.

UNDULATING PERIODIZATION

As the name implies, **undulating periodization** follows a less linear scheme than does the classic strength (power) scheme or the reverse linear periodization scheme. Undulating models are gaining in popularity in strength rooms because of their convenience and effectiveness.

Undulating periodization schemes typically follow a 14-day mesocycle with three or four different workouts to stagger (see Table 1 “Undulating Workouts”). This way, instead of sticking with one training phase for several weeks or more, the lifter can change intensity and volume from one workout to another. For example, if the lifter were following a whole-body training split, he or she might perform the strength

trophy workouts on Monday and Tuesday and strength workouts on Thursday and Friday. The following week the lifter might train with endurance workouts on Monday and Tuesday and strength workouts on Thursday and Friday. After the 2-week mesocycle the lifter could switch back to a different workout and perform the mesocycle over again, or the lifter can take a week off (especially if a competition is scheduled) and then return to the 14-day mesocycle.

One of the great things about undulating periodization is that it requires less organization and planning than linear periodized programs. For instance, if a person felt tired or sick (or conversely, the person felt exceptionally

Table 2. strong cycle

Week	% 1RM	Reps	Sets
1	55%	5	5
2	60	5	5
3	65	5	5
4	70	5	5
5	75	5	5
6	85	3	3
7	90	3	3
8	95	3	3
9	95	2	2
10	100*	2	2
11**	—	—	—

* Based on previous max.

** Active rest

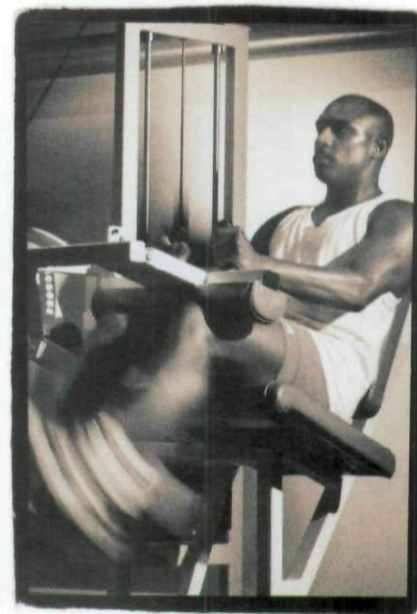


Table 3. linear muscle

Weeks	Reps	Sets (per Exercise)	Rest Between Sets
1–2	6–8	3	3–4 min
3–4	8–10	3	2–3 min
5–6	10–12	3	1–2 min
7–8	12–15	3	< 1 min

motivated and strong one day), the workout could be changed for that day to better suit mood and physical health. Or if scheduling was a problem and the lifter was short on time one day, she could switch to a workout with lower volume. Although it seems that such a training system that requires little planning would be less effective than a program that is scheduled months in advance, research has found that undulating periodized programs are just as effective as linear periodized models for the development of strength power and muscle mass (Marx et al. 2001; Kraemer et al. 2000) and are more effective than nonperiodized programs. One study by Rhea et al. (2002) found that undulating periodized training was more effective for developing strength compared to a linear periodized plan.

In actuality, the sporadic nature of the undulating program works as a default for building muscle, strength and power. That's because periodization is based on the fact that a physiological system makes adaptations to a stress that it is exposed to. Yet if the system is

exposed to the stress for too long, the adaptations will plateau and even

reverse to some degree. Given that, the undulating periodized scheme allows

the stress (strength training) to be encountered for very short periods before it is changed and then cycled back in. In this model, the different types of strength straining (heavy, light, fast or whatever) are cycled repeatedly from day to day. So it helps to keep the muscle from getting used to the stimulus, yet it exposes it frequently enough to cause progressive adaptations.

Table 4. undulating muscle

WEEK 1			
Day and Muscle Groups	Reps	Sets (per Exercise)	Rest Between Sets
Monday (chest, shoulders, triceps)	8-10	3	2-3 min
Tuesday (back, biceps)	12-15	3	< 1 min
Wednesday (legs)	6-8	3	3-4 min
Thursday (chest, shoulders, triceps)	12-15	3	< 1 min
Friday (back, biceps)	6-8	3	3-4 min
Saturday (legs)	10-12	3	1-2 min
WEEK 2			
Day and Muscle Groups	Reps	Sets (per Exercise)	Rest Between Sets
Monday (chest, shoulders, triceps)	6-8	3	3-4 min
Tuesday (back, biceps)	10-12	3	1-2 min
Wednesday (legs)	8-10	3	3 min
Thursday (chest, shoulders, triceps)	10-12	3	1-2 min
Friday (back, biceps)	8-10	3	3 min
Saturday (legs)	12-15	3	< 1 min

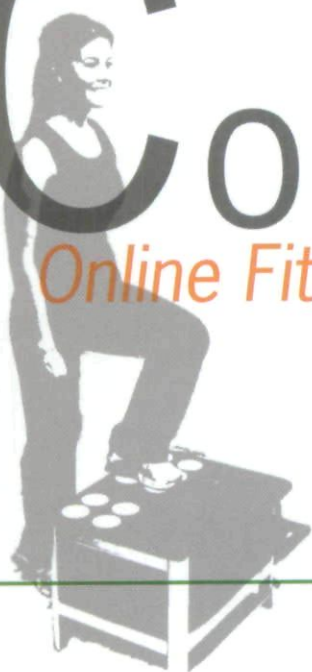
TYPES OF TRAINING CYCLES

Periodization is a term used by strength coaches, experts, and athletes who have been educated on the matter. Rarely will you hear the term used in the gym by bodybuilders or powerlifters, who refer to the concept of periodization as *cycling*. Although the minor details of cycling for powerlifters and bodybuilders are slightly different from the three periodized schemes discussed previously, they rely on the same premise: Change is good.

Powerlifters use several types of cycles to prepare for a competition. The most common cycle uses a gradual increase in the amount of weight used over time.

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Usually this starts out as low as 50% of the lifter's 1 repetition maximum (1RM) and progresses up to 100% of the 1RM weight for that lift over a 6–12 week period. See Table 2 "Strong Cycle" for a sample 11-week powerlifting cycle.

Bodybuilders also use numerous cycling strategies. In fact, an unlimited number of bodybuilding cycles could be used. The most common ones used are similar to the reverse linear periodization scheme (Table 3 "Linear Muscle") and the undulating periodization scheme (Table 4 "Undulating Muscle"). Although these athletes mix up their training frequently, the focus tends to stay on reps in the moderate to high range (8–20). Occasionally, these athletes train with heavy weight and low reps, but these phases are short and infrequent.

WHAT'S BEST FOR YOUR CLIENT?

Regardless of whether the goal is to increase power and strength or muscle growth, periodization is a necessary method for making continual progress. Only by cycling the training phases is it possible to keep the muscles adapting and prevent them from stagnating. Fortunately, numerous periodization methods can be employed. These include classic linear periodized schemes, reverse linear schemes and undulating schemes. So while any one periodization scheme will provide sufficient variability in the training program, using different periodization schemes promotes training variability and progress. Over time you should try them all to decide what scheme works best for individual clients. From there, you can choose to use that cycle as a primary scheme or frequently change up the cycles as you should for acute variables of training. ■

Exercise physiologist Jim Stoppani, PhD, served as a postdoctoral research fellow in the John B. Pierce Laboratory and department of cellular and molecular physiology at Yale University School of Medicine, where he investigated the effects of exercise and diet on gene regulation in skeletal muscle. Stoppani was awarded the Gatorade Beginning Investigator in Exercise Science Award in 2002. He is a member of the National Strength and Conditioning Association (NSCA), the American College of Sports Medicine (ACSM) and the International Society of Sports Nutrition (ISSN).

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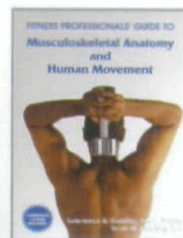
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