Variations of Periodization of Strength

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QUITE OFTEN THE SCOPE OF strength training is viewed as building "big muscles," since size is associated with strength. Although this is valid for bodybuilding, it is rarely a training objective for most sports.

The scope of strength training for sports is to make the neuromuscular system function as effectively as possible in order to meet the physiological needs of a given sport. Therefore, strength training is undertaken in order to develop power, or the ability of the muscles to apply force at the highest rate (e.g., sprinting), to deliver an implement with maximum speed (throwing, pitching, etc.), or to apply force against resistance for a long period of time, as in the muscular endurance required in swimming, rowing, or some team sports.

Consequently, the role of strength training for sports is to create a stronger physiological foundation in order to improve one's overall ability to meet the needs of a sport and enhance his or her performance. Such an approach is the most important ingredient in the "making" of an athlete.

In order to enhance neuromuscular qualities such as power and muscular endurance, strength training should be periodized. This means organizing and planning a program in a certain sequence over certain training phases, ultimately resulting in increased muscle power.

■ Periodization of Strength

Table 1 shows the basic model of periodization of strength (1), wherein several training phases follow each other in a certain sequence to best achieve strength development or power and muscular endurance according to the physiological needs of a given sport. An overview of the scope of training for each phase will help facilitate an understanding of this extremely important concept in strength training.

Table 1
Periodization of Strength for a Monocycle

Preparatory Phase
Anatomical adaptation
Maximum strength
Conversion to:
–Power
–Muscular endurance
Competitive Phase
Maintenance of:
–Power
–Muscular endurance
Cessation of strength training
Transition Phase
Compensation training

Anatomical Adaptation

Anatomical adaptation (AA) represents the first training phase in the continuum for maximizing the development of power (P) or muscular endurance (ME). One of the main training objectives of this phase is to render an athlete injury free by preparing the muscle groups, ligaments, and tendons to endure the long and strenuous phases of training that will follow. In addition, at least for some sports, one must (a) strive for a good balance of strength between the flexors and extensors surrounding a joint; (b) balance both sides of the body, especially the shoulders and arms; (c) perform compensation work for the antagonist muscles; and (d) strengthen the stabilizers.

The duration of the AA phase depends on the length of the preparation (preseason) phase, the athlete's background in strength training, and the importance of strength in that sport. Young, inexperienced athletes will need 8 to 10 weeks of anatomical adaptation to achieve the above goals. On the other hand, an experienced, mature athlete with 4 to 6 years of strength training background does not need more than 3 weeks to achieve the same goals. Anything longer might not have any significant training effect and therefore could be a waste of time.

Maximum Strength

The maximum strength (MS) phase plays a determinant role in the development of power and muscular endurance. Therefore the main objective of this phase is to develop the highest level of force, which is best achieved by using heavy loads of over 85% of 1-RM (6).

The MS phase lasts 1 to 3 months depending on the sport and the athlete's needs. Obviously, for sports in which maximum strength is key such as football and the throwing events in track and field, the duration must be long; in other sports such as tennis or basketball, a 6-week period may suffice.

Conversion

The main purpose of the conversion phase is to convert the gains made in maximum strength into a sport-specific combination of strength—either power (P) or muscular endurance (ME). This is best achieved by applying specific training methods for either of the two strength combinations detailed in *Periodization of Strength: The New Wave in Strength Training* (1).

First one has to plan a conversion prior to the competitive phase. For the conversion of maximum strength to power, 4 to 5 weeks is sufficient since both MS and P activities rely on proper synchronization of the muscle groups involved and on the quick recruitment of fast-twitch muscle fibers (4). On the other hand, transforming maximum strength into muscular endurance takes 6 to 8 weeks because improvements in endurance related activities require a longer adaptation time at the cellular level (5).

Strength Maintenance

A strength maintenance phase must be incorporated during the competitive phase if detraining is to be avoided. Although some coaches seem to think that as the competition season begins, athletes do not have to continue the strength maintenance program, the fallacy of this notion is often evidenced by decreases in performance toward the end of the season. It is important for coaches to understand that lack of a maintenance program for power and muscular endurance results in detraining, with the following negative elements:

- Muscle fibers revert to their pretraining size (7).
- There is a decrease in motor unit recruitment pattern along with a net decrease in amount of force that can be generated (3, 6).
- The decrease in power results in a decrease in speed, in turn affecting performance since muscle tension depends on the force and speed of stimuli and the firing rate of the muscles involved.

Therefore the main objective of the maintenance phase is to preserve throughout the competitive phase the strength standards achieved during the previous phases.

Transition Phase

One function of the transition phase is to help the athlete recuperate from the fatigue of training by replenishing energy reserves and relaxing psychologically. The other function is to maintain strength gains by performing some physical activity (50 to 60% of the volume of training undertaken during the preparatory phase), including strength training. If the athlete does not perform any strength training during these 4 to 5 weeks of lower intensity training, reductions in muscle size and power can occur (8). Compensation work involving mostly the antagonists and stabilizers is vital.

Variations of Periodization

Since athletes' backgrounds and the characteristics of their sports vary considerably, strength training must be specific enough to meet their individual needs. In other words, the basic model of periodization of strength is not applicable to every sport or athlete in exactly the same way. Thus it was necessary to develop variations of the basic model.

Some sports, or certain positions in team sports, require not only strength or power but also heavy mass. For football linemen, heavyweight boxers and wrestlers, and some throwing events in track and field, for example, it is an advantage to be heavy and able to display great power. Athletes such as these need to alter the original model to include a phase of training for the development of hypertrophy (H), or increased muscle mass. Such a model is shown in Table 2, wherein 6 weeks of hypertrophy development is interspersed between the AA and MS phases.

For sports in which a long preparatory phase is the norm, such as football, the coach may decide that a group of players need increased hypertrophy as well as maximum strength. The model to

Table 2
Periodization Model for Hypertrophy

Preparatory Phase

Anatomical adaptation
Hypertrophy development
Maximum strength
Conversion to:
–Power

Competitive Phase

Maintenance of:
–Power
–Maximum strength

Transition Phase

Compensation training

Table 3
Variation of Periodization Model for Hypertrophy and Maximum Strength

Preparatory Phase	
Anatomical adapt.	3 wks
Hypertrophy develop.	7 "
Maximum strength	6 "
Hypertrophy develop.	3 "
Maximum strength	3 "
Hypertrophy develop.	3 "
Maximum strength	3 "
Conversion to: –Power	3 "
Competitive Phase	
Maintenance of: –Power –Maximum strength	
Transition Phase	
Compensation training	

Table 4
Periodization Model for Sports

Track (sprint) Oct. 1–Sept. 30

Preparatory Phase 1 Anatom. adapt., 5 wks Max strength, 6 wks Convert to power, 4 wks	*Competitive Phase 1* Maintain improved & specific power, 10 wks	*Transition Phase 1* Anatomical adapt., 2 wks
Preparatory Phase 2 Max strength, 5 wks Convert to power, 4 wks	*Competitive Phase 2* Maintain improved & specific power, 9 wks	*Transition Phase 2* Compensation trng, 6 wks

Energy: anaerobic alactic & lactic; Limiting factors: reactive power, starting & acceleration power, power-endurance; Goals: max strength, reactive power, starting & acceleration power, power-endurance.

Football (lineman) April 1–March 31

Preparatory Phase Anatom. adapt., 4 wks Hypertrophy, 6 wks Max strength, 6 wks	*Competitive Phase* Convert to power, 4 wks Maintain max strength & power, early Sept–mid-Feb	*Transition Phase* Compensation trng, 6 wks

Energy: anaerobic lactic & alactic; Limiting factors: starting power, reactive power; Goals: max strength, hypertrophy, starting power, reactive power.

Swimming (sprinting) Sept. 1–Aug. 31

Preparatory Phase 1 Anatom. adapt., 4 wks Max strength, 6 wks Power, 3 wks Max strength, 3 wks	*Competitive Phase 1* Convert to power & power-endur, 4 wks Maintain power, power-endur, & muscular endur, 7 wks	*Transition Phase 1* Compensation trng, 2 wks
Preparatory Phase 2 Anatom. adapt., 3 wks Max strength, 6 wks	*Competitive Phase 2* Convert to power, power-endur, & muscular endur, 4 wks Maintain power, power-endur, & muscular endur, 7 wks	*Transition Phase 2* Compensation trng, 7 wks

Energy: anaerobic lactic & aerobic lactic; Limiting factors: power-endurance, muscular endur; Goals: power, muscular endur. (short), max strength.

Swimming (distance) Sept. 1–Aug. 31

Preparatory Phase 1 Anatom. adapt., 5 wks Max strength, 3 wks Muscular endur, 3 wks Max strength, 3 wks	*Competitive Phase 1* Convert to muscular endur (long), 6 wks Maintain muscular endur, 6 wks	*Transition Phase 1* Compensation trng
Preparatory Phase 2 Anatom. adapt., 4 wks Max strength, 3 wks	*Competitive Phase 2* Convert to musc. endur (long), 6 wks Maintain musc. endur, 7 wks	*Transition Phase 2* Compensation trng, 6 wks

Energy: aerobic; Limiting factors: muscular endurance (long); Goals: muscular endurance (long).

Volleyball June 1–May 31

Preparatory Phase Anatom. adapt., 6 wks Max strength, 6 wks Power, 3 wks Max strength, 3 wks Convert to power, power-endur, & musc endur, 7 wks	*Competitive Phase* Maintain power & power-endurance, mid-Nov.–mid Apr.	*Transition Phase* Compensation trng, 7 wks

Energy: anaerobic alactic & lactic; Limiting factors: reactive power, power-endur, muscular endur (med); Goals: power, muscular endur, max strength.

follow in this case is shown in Table 3.

For power sports, one can design a model in which both P and MS are stimulated. Gains in power accrue faster if muscles are trained at various speeds of contraction as opposed to being trained with approximately the same load (2). In addition, both power and maximum strength train the fast-twitch muscle fibers, resulting in more effective recruitment of these fibers that are so important in the development of strength and power.

Compared to the traditional training to exhaustion proposed by coaches influenced by bodybuilding concepts, this type of periodization is superior because it trains the nervous system to recruit more muscle fibers. Alternating the MS and P phases also changes the pattern of motor recruitment, resulting in higher stimulation of the central nervous system, especially during the power phase or when the training load for strength is over 85% of 1-RM. This kind of training leads to significant increases in power and maximum strength.

Periodization Models for Sports

As noted, the differences between sports calls for the development of models that are sport-specific. Before a model can be identified, 3 factors must be considered:

1. The dominant energy system for that sport;
2. The limiting performance factors from the point of view of strength;
3. The objectives for strength training.

For training purposes, the energy systems should be linked with the limiting factors for strength. This makes it relatively easy to establish the strength training objectives. The term "limiting factors for performance" means that if one fails to develop them at the highest level possible, the performance goals will not be achieved. The examples in Table 4 show how the 3 factors listed on this page represent the basis for a specific periodization model. Of course, before creating such a model, one must be aware of the competitive phase of the sport in question. ▲

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