

Periodization of Strength Part 1: Anatomical Adaptation

By Tudor Bompa

Date Released : 01 Mar 2000

Periodization of strength refers to the division of the training year into specific strength training phases with the objective to achieve peak performance at the time of the major competitions of the year. If properly manipulated, the specific training methods prevailing during the various training phases are expected to condition the athletes to optimal levels of performance.

In total there are five specific phases of strength training. The first phase is the **Anatomical Adaptation** phase (AA) followed by the **Hypertrophy** phase (HYP), **Maximum Strength** phase (MxS) and finally the **Conversion to Power/Power Endurance** (ConvP/PE) or **Muscular Endurance** (ME) phases of training. Individualized characteristics or demands of a sport will determine how the phases of training should be structured. For instance, a sport such as volleyball would not require a Hypertrophy phase of training whereas certain positions in football (i.e. linemen), where a large body mass is highly advantageous, a Hypertrophy phase of training is of paramount importance.

The following series of articles will discuss the phases of strength training. The physiological and practical aspects of each phase will be discussed along with general program design characteristics. The first article of the series will address the AA phase of training.

The AA phase represents the foundation on which the other phases of training are based. The name of this phase has been specifically selected to illustrate the fact that the main objective of strength training is not an immediate overload, but rather a progressive adaptation of an athlete's anatomy. The objectives of the AA phase are focused around "prehabilitation" with the hope of preventing the need for "rehabilitation." In other words, focusing on a higher volume of training with low to medium loads will aid in the adaptation level of an athlete's muscle tissue, ligaments and tendons, and prepare the body for the more challenging program inherent in the following phases of training. Furthermore, a methodologically structured AA phase will aid in the improvement of inter-muscular coordination (i.e. balance, coordination and neural firing patterns), and increase the bone mineral content and proliferation of connective tissue that surrounds the individual muscle fibers.

Depending on the athlete's level of physical development and strength training experience, an AA phase can be planned for three to ten weeks. During this long phase the program should be structured to include specific exercises intended to develop the core area of the body and stimulate muscle balance amongst the agonists and antagonists. In some cases, balanced development between agonistic and antagonistic muscles is impossible because some agonistic muscles are larger and stronger than others. For instance, the knee extensors (quadriceps) are stronger than the knee flexors (hamstrings).

The same is true for the ankle flexor (gastrocnemius) and extensors (tibialis anterior). Since activities such as running and jumping are heavily involved in most sports, the knee extensors and ankle plantar flexors are exposed to more training. Therefore, it is very important that trainers and coaches understand the agonistic-antagonistic ratios and attempt to maintain them through training. Neglecting to do so could result in injury and the need for rehabilitation. Most of the muscle groups should be trained and each set need not inflict an exorbitant amount of stress or discomfort on the athlete.

When designing an AA program for your sport, the easiest method to consider is circuit training (CT). CT represents a good organizational method that is fun to do and alternates the various muscle groups trained. CT can be used to develop both aerobic endurance and combinations of strength. For the purpose of the discussion, a CT program will be presented with the idea of developing strength.

In developing a CT program, a high variety of resistance devices can be employed such as surgical tubing, medicine balls, light implements, body weight, dumbbells, barbells and numerous strength training machines. A circuit may be short, (6-9 exercises), medium (9-12 exercises) or long (12-15 exercises) and repeated several times depending on the number of exercises involved. Obviously, the number of sets, repetitions per station and load must be individualized to meet the needs and the work tolerance level of the athlete. As mentioned earlier, during the AA phase the total work and intensity of training should not be so high as to push the athlete to the level of pain or discomfort. CT exercises must be planned in an alternating fashion that will aid in the faster recovery of individual muscle groups. The recommended rest interval between stations is 60 to 90 seconds and 1 to 3 minutes between circuits.

Considering the scope of the AA phase, exercises should be selected to develop the core area of the body as well as the main muscles used in your sport. Exercises that train muscles from multi-angles should be incorporated along with an overall flexibility program. To select the appropriate load (between 30-60% 1RM), the athlete should first test for one repetition maximum (1 RM) of the prime movers (muscles' primarily involved in the sport movement). Stations are selected in accordance to the equipment available in the gymnasium or fitness facility. It is expected that novice athletes will experience muscle soreness. Therefore, as a practical consideration, plan two to three sessions that introduce the muscles to the exercises using light loads. This will provide for a more effective means of discovering an athlete's true 1RM and training weight.

As illustrated in figure 1, training parameters for experienced athletes are quite different from those of a novice. A novice athlete should undergo a longer AA phase since they generally require a longer time frame for anatomical adaptation to occur. On the contrary, a longer AA phase of three to five weeks does not result in visible gains for the experienced athlete. The average duration of an AA phase, frequency of training sessions per week and other parameters for CT are suggested below for both younger and experienced athletes. Figure 2 presents examples of possible circuits utilizing various forms of equipment. These circuits far from exhaust the entire possible alternative plans, however, provide a few possible combinations and exercises.

Figure 1 – Suggested-training parameters for Circuit Training

<i>TRAINING PARAMETERS</i>	<i>NOVICE ATHLETE</i>	<i>EXPERIENCED ATHLETE</i>
Duration of AA	8-10 weeks	3-5 weeks
Load (if weights are used)	30-40%	40-60%
# of reps/station	*15-20	*10-15
Repetition tempo	slow-medium	slow-medium
No. of stations/circuit	9-12(15)	6-9
No. circuits/session	2-3	3-5
Total time of CT/session	20-25 min	30-40 min
Rest interval between exercises	90 sec.	60 sec.
Rest interval between circuits	2-3 min	1-2 min
Frequency/week	2-3	3-4

* approximate # of reps

Figure 2

Circuit A (own body weight)	Circuit B (Barbells and strength machines)
<ol style="list-style-type: none"> 1. Half squats 2. Push-ups 3. Bent-knee sit-ups 4. Two-legged low hops on spot 5. Back extensions 6. Pull-ups 7. Burpees 	<ol style="list-style-type: none"> 1. Leg press 2. Bench press 3. Incline sit-up 4. Chin-ups (gripping highest rung) 5. Upright rowing 6. Leg Curls 7. Lat pull-downs 8. Seated barbell press 9. Toe Raises

Circuit C (dumbbells and medicine balls)

1. Half squats
2. Medicine ball chest throws
3. Military presses
4. Bent-knee sit-ups (medicine ball held at chest level)
5. Medicine ball forward throws (between legs)
6. Lunges
7. Back arches, ball behind neck
8. Upright rowing
9. Toe raises
10. Trunk rotations
11. Overhead backward medicine ball throws
12. Jump squats and medicine ball throws

Every athlete regardless of the sport in question should complete an AA phase of training. The strength training experience of the athlete will ultimately determine the duration of this phase. Depending on the needs of the sport, an AA phase of training can be followed by a Hypertrophy phase or a Maximum Strength phase. Stay tuned for the next article, which will focus on the Hypertrophy phase of training.

[close](#)