

Asphalt Green Triathlon Training Institute

SLB Coaching & Training Systems

Periodization

Introduction

"The will to win means nothing without the will to prepare." - Juma Ikangas, winner 1989 NYC Marathon – 2:08:01

The first step in preparing is setting goals and designing a training plan. Your top priority should be to get the most physiological benefits from your training sessions and avoid injury. I base my plans on Arthur Lydiard's approach to training, incorporating Tudor Bompa's ideas, Jack Daniels and Vernique Billet's research. Training is not just running miles. In spite of what popular magazines, books and articles propose (mostly anecdotal and unsupported by research) there is a science to training. (Coaching is the art – molding the science to the athlete). Training phases, beginning with Recovery, followed by Base, Strength and Speed, can lead you to successful racing and prevent injury. Building endurance is certainly important, but building strength is the key to success and speed. Most athletes that are over 35 should never train on a track. All the necessary speed can be gained with much less injury prone workouts.

Some Definitions

Periodization / Phases – training for specific physiological benefits – cardiovascular endurance, strength, speed.

Macro Periodization – the overall phases of your training plan. Focusing on each of the five phases.

Micro Periodization – the variations in your training plan from day to day and week to week, i.e. hard day, recovery day, distance building week, long run week. The changes in training focus from day to day and week to week.

Principles of Exercise Physiology – training involves preparing your body for optimal performance. In order to improve we must follow six principles:

- **Stress** - In order to build endurance, strength and speed, you need to stress each of these physiological systems. The response to physical stress is growth in each of these areas.
- **Adaptation** – An athlete's body will adapt to the physiological stresses presented it. That is how we get fitter, stronger and faster. Adaptation is the response to physical stress.
- **Progression** – In order to continue to improve, you must increase the stresses. Working with the same weights will not cause an increase in strength.
- **Specificity** – Training is specific. The best way to improve your running is to run! You need to consider the distance and terrain of your goal race. There is no substitute for specific training.

Macro Periodization.doc

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<http://www.SLB-Coaching.com>

Coach@SLB-Coaching.com Neil.L.Cook@Mindspring.com

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Page 1 of 16

Asphalt Green Triathlon Training Institute

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Periodization

- **Individualization** – Each of us responds differently to training. Learn how you respond to each aspect of training and pay attention to what you learn. Adapt your training to the your specific needs and responses.
- **Reversibility** – All the gains from training will begin to disappear when training stops. Do not take this to mean you should not take time off. Rest is critical to successful training.

We have three physiological energy systems to produce energy. Understanding them and the way they provide energy is important to understanding how to train effectively.

- **ATP-PC** system or phosphagen system: available immediately, no oxygen is required, but can provide energy only for 8 to 10 seconds.
- **Glycolysis** system: starts in about 8 to 10 seconds, breakdown of glucose or glycogen to pyruvic acid or lactic acid, no oxygen is required, can last about 120 seconds. Sometimes referred to as anaerobic system.
- **Aerobic system**: starts after about 2 minutes, requires oxygen and last as long as oxygen can be supplied. Limited by your maxVO₂.

We need to build three behavioral components for optimal performance:

- **Endurance** – the ability to run for long periods of time at a comfortable to moderate effort.
- **Strength** – the ability to apply large amounts of force in a very brief period of time.
- **Speed** – the application of endurance and strength and the neuromuscular coordination required to move fast.

The result is our ability to perform at an optimal level. This is how we reach our goal of racing well.

The final component is **Recovery**. Allowing our body to rebuild after many months of hard work. In fact, the recovery phase is when you gain endurance, strength and speed. The building phases are actually the time we stress our systems so that they will adapt and improve. However, without the recovery period, our systems will not be able to adapt and improve. If we continually stress our body, our performance will plateau and eventually breakdown.

Training Zones:

Zone 0 – no training effect, very comfortable effort, below 65% of Anaerobic Threshold Heart Rate, Active Recovery, fat burning.

Zone I – Comfortable effort, between 65% and 80% of Anaerobic Threshold Heart Rate, warm-up, cool-down, long workouts 2+ hours, mostly fat burning.

Zone II – Moderate effort, between 85% and 95% of Anaerobic Threshold Heart Rate, aerobic workouts, shorter workouts 30 minutes to 2 hours, fat and carbohydrate burning.

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SLB Coaching & Training Systems

Periodization

Zone III – Hard effort, between 100% and 105% of Anaerobic Threshold Heart Rate, anaerobic workouts, strength and speed workouts, time trials, 30 to 60 minutes, carbohydrate burning only.

Zone IV – Very Hard effort, from 105% to Max of Anaerobic Threshold Heart Rate, max efforts, use only for peaking, 30 to 40 seconds.

I plan all my athlete's training programs using two "cycles" - Training Phases (Macro Periodization) and a Four Week Training Cycle (Micro Periodization).

Training Phases / Macro Periodization:

1. **Base Building** - focus is on aerobic endurance and building mileage - both weekly total and long workout. Effort level is comfortable to moderate, mostly Zone I with some Zone II. Should last at least 12 weeks, the longer the better.
2. **Strength Building** - focus is on building muscular strength - making muscles strong so they can go fast, Zones II and III. Should last 6 to 8 weeks.
3. **Speed Building** - focus is on neuromuscular movement - moving fast, Zone II, III and during peaking Zone IV. Should last 6 to 8 weeks.
4. **Racing & Maintenance** - this includes any necessary taper and the focus is on rest and race, Zones I, II and IV. May last 4 to 8 weeks.
5. **Recovery** - time "off" from serious training, Zones 0 and I. Should last 2 to 4 weeks.

The advantages of **Macro Periodization** are – you cannot be fast if you aren't strong and you can't be strong if you aren't fit. So, build the cardiovascular engine first, the muscular engine next and then work on neuromuscular coordination.

This is simplified a bit, since an experienced athlete (running for 3 years or more) can begin to build strength after 2 to 4 weeks of Base Building. It is critical however, not to attempt to increase speed until after strength has been developed. Otherwise, injury will be your reward for doing speed work too early in your training program.

In addition, speed work for adults - those over the age of 35 (not that those under the age of 35 are not adults), that have NOT trained continuously since high school or college, should only be Tempo or Pace work, Pick-ups, Time Trials and races.

I strongly believe that traditional speed work - track based intervals - are counter productive for most adult athletes and the same and greater speed can be developed using other training methods and racing (the exception is if your goal race is a track race).

Micro Periodization

The Four Week Training Cycle emphasize a different aspect of training each week, i.e. when increasing weekly mileage and distance of long runs:

1. **Base Week** - "normal" or "average" weekly total and long workout distance. Total distance is 30 miles, long workout is 10 miles.

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Page 3 of 16

Asphalt Green Triathlon Training Institute

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Periodization

2. **Increased Weekly Mileage** - increase weekly total, but not distance of the long workout. Total distance increases to 34 miles, long workout remains 10 miles.
3. **Increased Long Workout** - increase long workout distance, but not the weekly total. Total distance remains 34 miles, long workout increases to 12 miles.
4. **Recovery Week** - back to Base Week totals. Total distance drops back to 30 miles, long workout also drops back to 10 miles.

The Four Week Cycle (**Micro Periodization**) plan allows for two benefits - a recovery week every four weeks and increasing only one aspect of training per week - weekly mileage OR long workout distance. For most athletes this plan is ideal, providing optimal training and minimal risk of injury and burnout (direct burnout - athlete loses focus and indirect burnout - family or work loses tolerance!). The increases are gradual enough to allow adaptation and recovery. Some athletes can increase the intensity and distances by doing a Middle Distance run in the middle of the week on weeks 2 and 3.

Supplemental strength work - which I believe is critical to success and injury avoidance - should be started after 4 to 6 weeks of Base Building. Strength building with weights and Plyometrics are my preferred workouts.

Macro Periodization

Periodization is used to schedule specific types of workouts during each phase of training. These workouts are designed to meet the physiological requirements during each phase of training. Macro Periodization is planning for the training phases. Physiologically, there are five phases to training – **Base, Strength, Speed, Maintenance** and **Recovery**. You can think of these phases as pyramid.

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Periodization



Base Building Period (Endurance Building Phase)

The goals of this phase are:

- Build cardiovascular and muscular endurance.
- Improve $VO_2\text{max}$.
- Build up base mileage and distance of long workouts.

Build up the distance of your long workout gradually. The effort during this phase should be at a comfortable level. Usually, this is 80% or less of maximum effort. You need to include at least one long workout every two to three weeks.

The Base Building Period should last as long as possible, the entire winter is ideal. However, 12 to 16 weeks is necessary.

You must build cardiovascular fitness first. This is the starting point. Without a sound base – Aerobic Base, your entire training program will suffer. This phase is about training for time and mileage, but not for speed. You accomplish this by exercising at a comfortable to moderate effort as you increase both weekly distance (or time) and the distance (or time) of the long workout. Zones I & II, effort should be 65% to 95% of AT HR or 75% to 85% of maximal effort.

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Experienced athletes should add “aerobic” intervals – short, fast repeats. These are not the gut searing efforts required during the Strength and Speed Building Phases, but are limited to 80% to 85% efforts. They should last about 20 seconds per repeat, cover 50 to 100 meters and are smooth and relaxed. They will combat the negative effects of endurance building workouts. Use them to maintain biomechanical efficiency.

As you build endurance, you should also begin building strength. More advanced athletes can add one workout per week after the first four to six weeks of the Base/Endurance Building Phase that is devoted to strength building. The best way to add a strength-building workout is to add hills. Doing hill drills and hill repeats builds strength and reduces the risk of injury. You can add one hard workout after the first four weeks of Base Building. This workout should include periods of 4 to 8 minutes of near maximal effort Zone III. Begin with 4 repeats and work up to 10 to 12 repeats over a couple of months. This is best done by using hills – skipping or running slowly with high knee lift and getting your feet off the ground.

After a recovery phase of 2 to 4 weeks after your prior season, you should start your Base Building Period. During the Base Building Period, your goals are to increase aerobic fitness and increase mileage.

During the week, alternate medium distance workouts with Active Recovery Days (or days off). It is usually better to take an Active Recovery Day, than to take a day totally off. This would be a workout of about 30 minutes – an easy effort (75% or less, Zone 0 – Below 65% of AT HR) with friends. The benefit of an Active Recovery Day over a day off is that if you increase the blood flow to muscles the waste, excess fluids and soreness will diminish faster than with total rest.

Strength Building Period

The goals of this phase are:

- Build muscular strength.
- Increase capillary beds.
- Build mitochondria.
- Improve Lactate enzyme response.
- Raise Lactate Threshold.
- Improve economy.
- Maintain cardiovascular and muscular endurance.
- Maintain VO₂max.
- Maintain base mileage and distance of long workouts.

The Strength Building Phase should last 6 to 8 weeks.

This is the time when you focus on increasing your strength. After building a sound endurance base, you are ready to begin building strength. The best way to do this is by working out on lots of hills! Running on hills is the fastest, and safest, way to build strength.

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Periodization

The Strength Building phase is often neglected. After building a good solid Base (Endurance) athletes that move directly into the Speed Building Phase will often risk injury and will diminish their success.

During the Strength Building Phase, your hard (hill) workouts should increase to two per week. The important feature of these workouts is raising your heart rate over 90% of max (or 100% to 105% of AT HR) for periods of four to eight minutes at a time. Start with 4 repeats up a 6% to 9% hill and increase up to 10 to 12 repeats. The hill should take you between 4 and 8 minutes to climb. The recovery interval should be at least equal to the hard effort repeat. Your heart rate should return to around 60% to 65% of maximum effort before beginning your next hard repeat. If you are racing on the weekend, eliminate one strength workout that week. Continue with your long workouts once per week. All other days should be easy to moderate efforts (Zone I and II) or Active Recovery days. Your weekly mileage should be close to the maximum you reached for the Base Building Phase.

During these workouts, emphasize muscular effort instead of speed. Do not worry about getting up the hill fast. Use muscle power to get you up the hill. Emphasize getting your feet off the ground. Skipping is an excellent hill drill.

Supplemental Strength Training

You should supplement your strength training.

Plyometrics

You can also add a supplemental workout to your weekly training plan. Plyometrics are an excellent strength building method. Add a single Plyometric session each week. This session should only take 30 minutes. Select a routine that emphasizes explosive leg strength. Be sure to warm-up and cool-down properly. Focus on explosive leg strength. Plyometrics is Explosive Strength training. Explosive strength has been shown to be a key element of cycling and running performance. By increasing your explosive strength during the Base Building and Strength Building Phases you will prepare your body for the Speed Building Phase. (See [sample Plyometric exercises at the end of this document.](#))

Strength Building Exercises

Weights are the traditional method of building strength. Use free weights so that you are building strength around the joints by engaging several muscle groups simultaneously as you do while cycling and running and not isolating single muscles. Do not spend more than 20 or 30 minutes in the gym per session. Work with free weights and/or pulleys, not machines. Vary your weight workouts from week to week. Do two to three workouts each week. They should last between 30 and 45 minutes – no longer.

Do one exercise in each of the following areas:

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Periodization

- **Arms Pushing** – extend (straighten) elbows against resistance, press (standing, seated with barbell or dumbbell), bench press (flat, incline, decline), dips, pull-ups
- **Arms Pulling** – flex (bend) elbows against resistance, row (seated, bent-over, one arm with barbells or dumbbells)
- **Abdominal** – static (Side Lying Bridge, Prone Plank, Supine Plank) or concentric/eccentric (crunch). Increase resistance, rather than increasing reps.
- **Lower Back** – back extension (45° or 90°), Good Mornings, stiff-leg dead lift
- **Squats.** – step-ups, lunge, leg press

Do one to three sets of 6 to 8 reps for each exercise. Do all exercises with FULL range of motion. Use a weight of 80% to 85% of 1 Repeat Maximum (1RM) for 6 to 8 reps. You can also use 130% of your 10 Repeat Maximum (10RM).

Planks

Planks are an excellent way to build core strength. Do one to two sets of these four Planks, holding each for up to 60 seconds. When you can hold a position for 60 seconds, remove one arm as support. When you reach 60 seconds remove one leg as support also.

Prone Plank:



Supine Plank:

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Side Plank (do right and left sides):



Prone Plank Arm Raised:



Prone Plank Leg Raised:

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Supine Plank Arm raised:



Supine Plank Leg raised:



Side Plank Leg raised:

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Speed Building Phase

The goals of this phase are:

- Improve economy.
- Build speed.
- Improve velocity at $VO_2\max$ ($vVO_2\max$).
- Improve time limit at $vVO_2\max$.
- Maintain muscular strength.
- Maintain Lactate Threshold.
- Maintain Lactate enzyme response.
- Maintain capillary beds.
- Maintain mitochondria.
- Maintain cardiovascular and muscular endurance.
- Maintain $VO_2\max$.
- Maintain base mileage and distance of long workouts.

Many people will not need to do this phase of training. If speed is not important – if your goal is just to improve your enjoyment or to increase your race distance, but time is not important – then you can skip this phase. Only the serious competitive athletes should train through this phase. This phase is when you use short and very intense bouts of speed to train your body to move faster. It is very important to allow near full recovery between repeats of speed work.

It is only possible to successfully build speed after the base (endurance) and strength phases have been completed. Never attempt to build speed until these two phases have been successfully completed.

This phase will focus on speed. When most people think of speed, they think of track intervals. I believe that this is a mistake for adult athletes. Unless the goal event is a track race, I suggest never doing speed work on a track. The surface is hard, the turns are tight and it is hard to avoid “competition.” All of these factors lead to increased risk of injury. Unless a runner is under 35 and has been training continuously since leaving school, and at a high level, I never use track work for my athletes.

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Page 11 of 16

Asphalt Green Triathlon Training Institute

SLB Coaching & Training Systems

Periodization

Instead, use time trials, races and speed drills – on roads, trails and grass. The softer surface is important to avoid injury. This is a good phase to do races – they will provide good speed work and you will gain competitive experience.

Focus on Time Trials and racing during this phase. Schedule two to three hard or fast workouts (speed workouts) each week. Three on the weeks you are not running long, two on the weeks your run long. Continue with long workouts or add races or time trials to the weekend workouts. All other runs are Active Recovery - short, VERY easy.

Effort should be Zone III (100% to 105% of AT HR) and Zone IV (105% of AT HR to Max HR). This are hard and very hard efforts (90% to 100% of Max HR). But, the duration should be short.

Reduce supplemental strength building - shorter sessions and lighter weights. Do not dramatically increase the number of reps or sets.

Speed Phase is about training your motor control system to move you fast. Reduce volume and overall intensity. Long run once every other week. Use a long rest between hard/fast efforts. Get your HR back down to 65%-75% maximum before you start the next repeat.

Use four types of workouts:

1. **Time Trials or Race** - short in time than your goal race. Run at 90%-95% effort
2. **Speed Intervals** - run 50/100 meters at a "Comfortably Fast" effort. Allow full recovery
3. **Speed Drills** - Butt kicks, High Knees, High Knees/Skipping, High Knees/Hop (see list below).
4. **Fartlek** – ("Speed Play") "Comfortably Fast" efforts for 30/60/120/240 seconds, return to comfortable pace.

The keys are to reduce your volume and effort to allow your body to fully recover from the hard training you've been doing. Focus is on running relaxed, fast and with good form. ALWAYS stop when your form breaks down.

Speed Tests

Use these tests to measure your improvement during the Speed Building Phase. Test yourself at least every month, if not every week.

30 meter Flying Start – count strides and multiply by time for the 30 meters = Speed Index. 3 trials with 5 minute rest.

30 meter Sprint Bounding – count strides and multiply by time for the 30 minutes = Speed Index. 3 trials with 5 minute rest.

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Periodization

Time Trials – use a distance less than your goal race distance and run at near maximum effort.

Speed Drills

- **Marching with High Knees**
- **Marching with High Knees with lower leg extension** (“pawing” at the ground, not swinging our your lower leg)
- **Skipping**
- **Skipping with High Knees**
- **Skipping with High Knees with lower leg extension** (“pawing” at the ground, not swinging our your lower leg)
- **Running with Skip and High Knee**
- **Running with Skip and High Knee with lower leg extension** (“pawing” at the ground, not swinging our your lower leg)
- **Maximum # Foot Contacts** – in 10 seconds.
- **Sprints** – 5 to 10 X 30 to 80 meters with 3 to 5 minute rest between.
- **Hills Sprints** – both up and down a 10% grade, 100 meters.
- **Side Skipping** – side step & cross-over.
- **Butt Kicks** – alternate legs.
- **Jump Drill** – with partners, 3 sets of 10.
- **High Knees** – drill for 100 yards
- **High Knees w/hop** – drill for 100 yards
- **Stride-Outs** – 100 yards comfortably Fast.
- **Fast Running** – 100 yards to 100 yards Comfortably Fast with the wind behind you, focus on running tall, relaxed from the waist up, 3 minute jog recovery.
- **Fast Running with High Knees** – bring knees up high and drive hard forward, using hip and ankles to “spring forward” 3 minute jog recovery.
- **Toe Running** – lift up high on your toes as you run forward, 3 minute jog recovery.
- **Combine Fast Running, Fast Running with High Knees and Toe Running** – 50 yards to 100 yards, 3 minute jog recovery.
- **Stride the Straight-aways Jog the Turns** – stride fast and relaxed through the straight-away and jog the turns, repeat six times, jog 15 minutes recovery.
- **Step Exercise** – 3 sets of 10 each leg.
- **“Tag”**
- **Caterpillar or Indian Line Drill**

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Page 13 of 16

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Periodization

Speed Workouts

- Run your goal distance divided into segments i.e. 10 Km divided into ten 1 Km segments. Run each segment 2 to 3 seconds faster than goal pace. Start with 5 second recovery between segments and reduce the recovery period of time – 4 seconds the next session, 3 seconds the following session, and so on.
- Experienced runners (with at least 3 years of continuous training) can add a speed workout after 4 to 6 weeks of cardiovascular training, and 2 to 4 weeks after adding a strength workout.
- Always train all three components – cardiovascular (endurance), strength and speed.

Maintenance Phase (Taper, Goal Event) / Racing Phase

This is what you have been training for, your goal event. Enjoy! You should taper for 1 to 3 weeks prior to your goal event. Reduce your weekly mileage and eliminate your long workouts. Do not cut back on the number of workouts you do. Cut back on the duration of each workout and the intensity. However, it is important to do some "fast" efforts during the taper.

This is the time to allow your body to recover from all the hard work you've put it through. Get plenty of sleep, avoid stress and eat well. Stay focused on your goal. Stay positive.

Recovery Phase

Most athletes overlook this phase. This is the time to relax, reduce your mileage and effort. This will make you stronger the next year. The biggest benefits of training well are reaped the second year.

If you do not take a recovery phase, your body will eventually break down. In addition, you will not continue to improve.

Phases and Duration

Phase	Duration	Description
Endurance	12 to 16 weeks	Build distances - weekly totals as well as long workout.
Strength	8 weeks	Strength Drills, Lactate Threshold workouts. Maintain distances and long workouts.
Speed	6 to 8 weeks	Speed Drills, reduce distances and long workouts, but don't eliminate them. Begin racing.
Taper	1 to 2 weeks	Maintain number of workouts, reduce duration and intensity. Maintain "fast" segments.
Racing	4 to 8 weeks	Stay sharp, rest and enjoy.
Recovery	2 to 4 weeks	Rest, easy workouts, no racing. Recharge.

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Periodization

Build for Two Years Ahead

The real benefit of this type of program is two years in the future. You will reap benefits during the first year you adopt this approach to your training, but the greatest benefit will be two years after you start this type of program.

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SLB Coaching & Training Systems

Periodization

Recommended Reading

My educational background in physical education, coaching and neurophysiology, my running as an adult, the many athletes and coaches I've worked with, along with these authors and researchers have greatly influenced my coaching and the ideas in this article. Here are some of the major influences.

Van Aaken Method, Ernst van Aaken, World Publications, 1976 (out of print) – called the “father of LSD.”

Running the Lydiard Way, Arthur Lydiard with Garth Gilmour, World Publications, 1978 (out of print)

Running with Lydiard, Arthur Lydiard with Garth Gilmour, Hodder and Stoughton, 1983 (out of print)

The Runner's Coach, Roy Benson, Cedarwinds Publishing, 1994

Running to The Top, Arthur Lydiard in collaboration with Garth Gilmour, Meyer Verlag, 1997

Daniels' Running Formula, Jack Daniels, Human Kinetics, 1998

Lactate Lift-off, Owen Anderson, SSS Publishing, 1998

Periodization, Theory and Methodology of Training, Fourth Edition, Tudor O. Bompa, Human Kinetics, 1999

Periodization Training for Sports, Tudor O. Bompa, Human Kinetics, 1999

Coach Benson's "Secret" Workouts, Beaufort Books, 2003

Great Workouts for Popular Races, Owen Anderson, SSS Publishing, 2004

Run Strong, Kevin Beck editor, Human Kinetics, 2005

Running Research News, Owen Anderson editor, monthly newsletter reviewing research