Team CdLS ½ Marathon & 5K Training

Tips for the Week of 7-11-2011

There are **10** weeks to go before the Saratoga Palio Half Marathon & 5K.
½ marathoner's - your first rest week has arrived.

We now begin a 10-week training program targeted for the <u>5K runners</u>.
Find your training workout at the end of this document.

Rest Week

The basic progression of ½ and full marathon training follows a pattern of two build weeks, followed by a rest week. During the build weeks, a mile is added to both the week-end long run and a mid-week run. This allows for a slow, steady, and safe build up of the two most important workouts. During the rest weeks, the mileage for these runs is reduced. This allows the body to recover from the increased mileage and to prepare for the next build week.

Please take the rest weeks seriously. Cutting back on the long run this weekend may not seem necessary. But keep in mind that your number one goal is to get to the starting line healthy. A slow increase in mileage with some cut-back weeks will help you achieve that goal. And finally, you will really appreciate these cut-backs later in the summer, when the long run distance for the rest week can reach 10 miles!

Following this progression over the 18 weeks of your training, the long run distance is increased to 10-12 miles and the mid-week pace run distances reach 8-10 miles. You can expect your weekly mileage to double during this period. So, if you started your training with 10 miles per week base, you can expect to be running 20 total miles in the ~sixteenth week.

VO2 Max

Many of you have heard of this either in your readings or from fellow running companions. It's a **very important adaptation** that I would like to try to explain (forgive me in advance as this too may get a bit technical). Stick with me for a minute.

One of the most important training adaptations is an increase in the maximal oxygen uptake, called VO2 Max, which is a quantitative measure of a person's capacity for aerobic energy transfer (the ability to do work). An improvement in VO2 Max thus increases the amount of work you can do, that is you can run faster and/or farther. Variables that determine VO2 Max are heredity, sex, body composition (the amount of lean body tissue), age and training. Obviously you can do nothing about several of these variables, but improvements of 20-30% in maximal oxygen uptake because of training have been observed. VO2 Max peaks within 6 months to 2 years after starting an

endurance training program. However, even after it has leveled off, it is still possible to improve performance. Typical ½ marathoners are able to maintain their pace using approximately 75-80% of VO2 Max for the approx. 1.5-3 hours required. The ability to run at higher percentages of VO2 Max may be explained by the concept of lactate threshold or lactate tolerance. Lactate threshold is the point when increasing intensity of exercise causes lactic acid to accumulate and impair performance. I addressed this issue in my week 18 training tips. Improving the lactate tolerance means that you can run harder for a longer period of time and use the lactate in your blood as an additional energy source. Studies have shown that lactate threshold can be easily shifted by endurance training and is an early response to increased mileage.

Understanding that maximal performance levels (VO2 Max and top speed) are not as important as endurance in achieving performance in a ½ marathon is critical for training. ***How fast you are makes no difference if you cannot maintain the pace for 13.1 miles.*** So slow down and enjoy the journey.

Improving Running Economy

This interesting, lengthy and a bit technical, article looks at the evidence for several areas that I think that a runner can improve technique. Namely, the evidence for: i) foot contact time and cadence and ii) plyometric and strength training – ways to improve speed and economy without necessarily increasing fitness.

None of these ideas are secrets, and you don't need to buy expensive training courses to learn, utilize or benefit from these strategies. As always, these techniques need to be adopted slowly, preferably under the supervision of an experienced coach who can evaluate you as an individual. Don't feel you need to read this section…..it's technical.

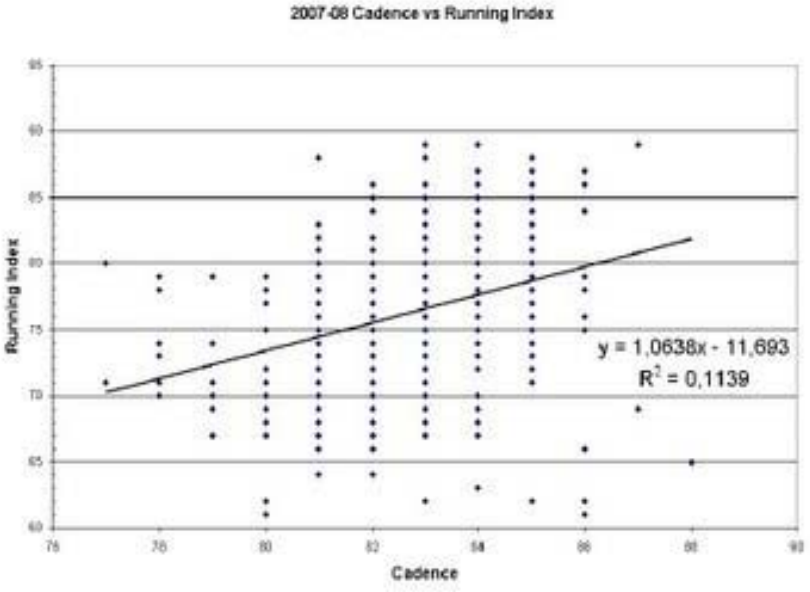
Improving Running Economy: Cadence and Contact Time

Do you ever watch other people running? It seems like some of them float along, barely touching the ground, while others seem to labor slowly forward, with excessive movement and heavy footfalls. Think a bit about how the graceful ones look – quick, light steps, no overstriding and no scuffing and scraping noises when their shoes contact the ground. They seem more efficient and it shouldn't be a surprise that they are. An exercise physiologist might call this "economy." Some of these attributes can be developed in an athlete by focusing on one thing – running cadence. Cadence is simply the rate at which leg turnover occurs (i.e., how many steps are taken per minute). If your left foot contacts the ground 70 times per minute, your cadence is 70. The best athletes in any distance over about 2,000m run with a cadence of about 90. No matter the speed, cadence stayed pretty much the same, only stride length varied. Most beginning runners tend to run with cadences of 80/min or less.

The quick cadence decreased injury by minimizing vertical oscillation (and, therefore, landing forces) and is more economical because it minimizes "ground contact time" –

GCT. GCT is the time that a runner's foot spends on the ground with each step. As an athlete's speed increases GCT naturally decreases, but this can still vary between runners. A shorter GCT implies that you are spending less time planted on the ground, but also the force generated by each step occurs over a briefer period of time, which minimizes force absorption and dissipation. We should all aim to run with a cadence of approximately 90/min, as this was optimally efficient.

The Polar Running Index is a proprietary measure that attempts to give you a global assessment of your running performance during any workout. Although the exact formula is not public knowledge, it isn't that difficult to figure out. Basically, it calculates what your heart rate is as a percentage of your max HR (used as a surrogate for VO2max) and measures your running speed at that HR. By normalizing your speed to heart rate, it can compare runs at different speeds. Simply put, it can tell you if you are getting fitter/more economical over time, even if you are running at different speed and HRs. It thus gives a global measure of fitness and running economy.



We compare cadence to running index over many runs and found that the best running index measures cadence as it approached 90. This would seem to support the empiric observation for the cadence for optimal performance in longer distance events.

Beyond GTC and decreased vertical oscillation, I wonder whether there might be biochemical reasons why optimal running economy might happen around 90 strides/min. In a study performed in the early 1990s, eight cyclists were asked to pedal on two occasions at 85% of their VO2max for 30 min. The first time, they used a bike gear that required a cadence of 50 rpm, and on the second occasion, a gear that required a cadence of 100 rpm.

With the slower cadence (i.e., higher resistance) pedaling Type II muscle fibers ("fast twitch") used up glycogen 50% faster than during high cadence (lower resistance)

pedaling. Type I fibers ("slow twitch") used fat and glycogen at about the same rate at either cadence.

So why might this affect economy? At slow cadences, as type II fibers run out of glycogen, they are less able to contract, forcing the recruitment of other muscle groups. This leads to: i) deterioration in form and ii) less efficient use of energy and oxygen. Both of these factors can contribute to less effective cycling.

I haven't seen similar research in runners, but it isn't difficult to imagine that a similar process might apply. Very slow gaits, with more vertical oscillation, greater ground contact time and so on require more use of type II fibers, and less efficient glycogen/oxygen use with concomitant deterioration of running form. This could lead to poorer economy. Just a theory, but it is biologically plausible. Something I will have to test in the lab someday, I think!

Take home message? Gradually try to increase your cadence to a number close to 90/min. Changes in speed should come more from variations in stride length than changes in cadence.

Improving Running Economy: Strength Training

Above is outlined some of the possible benefits on running economy of increasing cadence. Increases in cadence may improve economy by shortening stride length enough to prevent overstriding (and thus braking), decrease ground contact time (and thus improve energy return) and may decrease injury by lessening impact forces on landing. I wonder whether a lot of the alleged benefits of fore/midfoot running aren't simply due to the effect that they have on stride length and cadence, rather than the actual part of the foot that is landed on *per se*.

In this section, we review some of the evidence for strength training as a way to enhance running performance.

The first thing to be clear about is definitions. By strength training, I mean focused strength exercises primarily for the lower body. The objective isn't to "get bigger" but to enhance muscle unit strength and, more importantly, neuromuscular coordination and muscle unit recruitment.

There is a lot of evidence that focused strength training can improve running performance in both short and long distance events. For example, a group of Norwegian researchers found that a focused plan of "half squats" with heavy weights improved running economy by 5% and time to exhaustion at maximal aerobic speed (i.e., the pace you would run at when at VO2max) by 21%. This occurred after 8 weeks of 3 sessions a week. The most relevant figure from this paper is shown below.

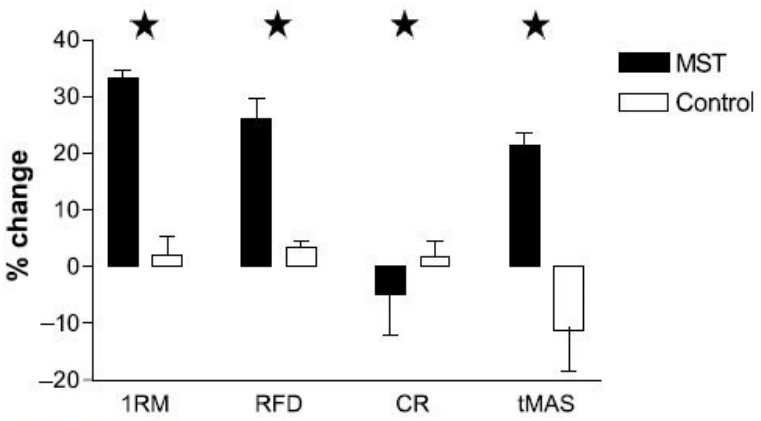


FIGURE 1—Percent changes from pre- to postintervention in the training group and the control group. *$P < 0.05$, between-group differences. 1RM, one repetition maximum half-squat; RFD, RFD half-squat; CR, cost of running; tMAS, time to exhaustion at MAS.

Similarly, French scientists found that a 14 week program of heavy lower limb weight training, which occurred concurrently with endurance training improved running economy in 5km trials.

What is interesting about both of these studies (and shown in many similar studies) is that this improvement in running times occurred without an improvement in aerobic fitness as measured by VO2max. We can therefore conclude that the improvements were due to better efficiency in running (i.e., running economy). This was presumably because weight training improved the effectiveness of recruitment of the involved muscles or allowed the recruitment of stabilizing muscles – thereby improving stride efficiency.

During endurance training some runners find that their stride length shortened as compared to when they are focusing on speed training. A group of Spanish researchers demonstrated that weight training prevented runners from developing a “marathon shuffle.”

The trick for most of us is to actually find the time to add this type of work into our training regimen. I think that there are a few general rules that apply: start with small doses of weight training, begin in the off season, and don’t become a weight lifter rather than a runner.

In the next section, I outline a strengthening program that combines the benefits of strength and plyometric training for endurance runners.

Improving Running Economy: Jumps!

There is clear evidence that lower body strength exercises can improve running economy (and, therefore, performance) in well trained runners.
Is it better to add weight training or more running volume to improve performance? This is an excellent question, as it gets to the heart of many "cross-training" myths. Many people feel that they can cross train their way to better running. I think that cross training in other sports is very beneficial, particularly in that it can allow development of stabilizing muscles, avoids developing the not 100% attractive "runner's physique," prevents burnout and is, well, …fun! **However, there is no doubt that the strongest predictor of distance running improvement is volume of running.** So if you can increase your volume further (without injury or burnout), this is probably the way to go. But…if you have hit the point where more volume leads to injury, excessive recovery time, or if performance has plateaued, then adding non-running training seems prudent.
The second question asked about plyometric training. Plyometrics is a system of exercises that uses rapid, explosive movements to improve power. Examples include hopping, bounding, box jumps and so on. The mechanism by which plyometric training increases power is interesting. Rather than increasing muscle strength/mass, plyo exercises improve musculotendinous stiffness – thereby improving the "energy storage" and energy return during resisted movements. For example, plyo box jumps will, over time, improve the efficiency with which the energy stored in the tendon/muscle during landing is released. In a sense, it improves the "spring action" of the muscles and tendons. If you think back to my explanation about ground contact time, you can see that a more powerful push off during running is beneficial. So what's the evidence?

There are several studies that show a link between plyometric training and improved running performance. The one I like best (because the scientific method was the most rigorous) was published in 2003 in the European Journal of Applied Physiology. In this study the authors found that a 4 month plyometric program improved running economy and 3km race time by 2.7%.

While 2.7% isn't a trivial improvement, I do have some concerns about most runners adopting plyo training. Essentially, I think that this is a high risk tool. The rate of injuries doing plyo training is relatively high, and I think that the most extreme drills – box jumps, cone jumps, etc, are probably best done only by experienced athletes with coaching supervision. More traditional drills such as on-track hopping and bounding are probably reasonable if done carefully. However, I think that the large majority of the improvements in economy seen with these drills can probably be achieved more safety with strength training.

Suggested Week 10 Training Schedules:

Below are suggested workout schedules for the three types of **½ Marathon runners** for this **rest week**.

Week 10	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Type of Runner	**7/11/11**	**7/12/11**	**7/13/11**	**7/14/11**	**7/15/11**	**7/16/11**	**7/17/11**	**Total Weekly Miles**
1st Timer, Novice Runner	3 Miles Easy	**Rest**	2 Miles Easy	2 Miles Easy	**Rest**	3 Miles Easy	Rest or Cross Train	10
2nd Timer	Strength & 2 Miles Easy	3 Miles Easy or Tempo	**Rest**	3 Miles Easy	Strength & 2 Miles Easy	4 Miles Easy	Rest or Cross Train	14
Experienced ½ Marathoner	Strength & 2 Miles Easy	3 Mile Tempo	**Rest**	4 Miles Easy	Strength & 2 Miles Easy	5 Miles Easy	Rest or Cross Train	16

Below is my suggested workout schedule for the **5K** runners for this **week**.

Week 10	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Type of Runner	**7/11/11**	**7/12/11**	**7/13/11**	**7/14/11**	**7/15/11**	**7/16/11**	**7/17/11**	**Total Weekly Miles**
5K Runners	30 min. run easy	5:00 min warm up; 10 x 1:00 run/1:00 walk; 5:00 min cool down walk	30 min. run easy or Rest	5:00 min warm up; 10 x 1:30 run/1:00 walk; 5:00 min cool down walk	**Rest**	30 min. run easy	Cross Train	8-10

Experienced & Veteran ½ Marathoners:

This week for the speed workout we're doing half-mile repeats at 10K pace. What makes this workout tough is the shortened rest interval. The key to finishing the workout is to not run at too fast a speed.

Estimate your 10K pace by lopping off the two right-most zeros from your ½ Marathon Target Time. This will give you a half-mile split that is pretty close to your 10K pace.

Run the repeats in sets of four, so that you can get water during the workout. The first three half-mile repeats are followed by a 1 minute and 15 second rest. Follow the third repeat with a 2 minute break.

Base the number of repeats on your weekly mileage:

15 Miles per week:	4 repeats or less.
20 Miles per week:	4 - 6 repeats
25 Miles or more:	6 - 8 repeats

Enjoy and stay well hydrated!

Coach Marc