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Something New in Training:
The Methods of Renato Canova

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Easter weekend of 2009 was called "the weekend that changed marathoning forever," after 13 Kenyans broke 2:09 at the Rotterdam and Paris marathons, including Duncan Kibet and James Kwambi, who both ran 2:04:27 at Rotterdam in a sprint finish. In the wake of this stunning weekend, Renato Canova made a series of posts on Letsrun.com concerning the training methods employed by himself and Italian compatriot Claudio Berardelli. Berardelli coaches world-class Kenyan athletes from 800m to the marathon, as does Canova. I will lay out a synopsis and analysis of the training methods of Renato Canova and explore this concept of "something new in training": namely, why Kwambai and Kibet can run relatively low mileage and have success in the marathon, whereas others like Martin Lel and Robert Cheruiyot train with a more traditional high-mileage approach. I have "translated" much of the paces, distances, and times into the imperial unit system to make them more accessible to an American audience.

Without further introduction, we will first learn the basic workings of Renato Canova's training program for elite runners from 800m to the marathon. Canova categorizes workouts as belonging to one of four categories: regeneration, fundamental, special, and specific.

Regeneration is easy running that is designed to expedite recovery from hard training sessions. According to Canova, blood lactate levels can remain elevated for 2-3 days after a hard effort if a regeneration run is not used to 'flush out' the body. Regeneration is a pace approximately 60-70% of the anaerobic threshold (AnT). Canova uses the example of a top marathoner with an AnT of 4:30/mi. For him, regeneration pace works out to about 5:50/mi or slower (see page 9 for an important note on percentages).

Fundamental training is comprised of long, continuous runs at roughly the aerobic threshold (AeT) or a bit slower. Canova illustrates this pace with a 15:00 5k runner (presumably female). Her pace for "fundamental" workouts would be in the range of 5:33 to 6:00 per mile. If we compare this to Dr. Jack Daniels' commonly-used VDOT charts, we find that they predict an aerobic threshold (AeT or "M pace") of 5:32/mi, very much in line with the high end of Canova's training. Interestingly, the low end of the fundamental training pace dips into what some might call "junk mileage." Certainly, there must be benefits at running a 'relaxed' long tempo run, as opposed running right at the aerobic threshold every single time—this will be explored later in more detail.

Special training focuses on extending endurance at about 90% of the speed of your primary event, as well as improving mechanics at faster than race pace—105% or more of the speed of your primary event. So, a 13:00 5k runner might do 2000m repeats at 14:10 pace, but at a high volume, or he might run fast 300m repeats with long recovery. Longer competitions (cross country and 10,000m for a 5k runner) are also classified as "special training." For marathoners, however, special training is exclusively faster and shorter than marathon pace.

Specific training is focused on the speeds most pertinent to your specific event. In short, specific training occurs at 95% to 105% of the speed of your event.

After understanding Canova's four broad training categories, we can better understand his training philosophy; namely, that **the most important training is that which is conducted at the speed of the race you want to run.** That is, your "specific training" matters most. All other training exists *solely* to support the specific training. Furthermore, improvement comes from the supercompensation in response to a training stress—so as the athlete reaches higher levels of fitness, the training stress must be different and greater in magnitude. The overarching question during the early and mid-season training is "how can we better prepare ourselves to sustain and recover from a high workload of race-specific training?"

A season under Canova consists of a roughly six-month training cycle, comprised of (predictably) an introductive period, fundamental period, special period, and specific period.

The **introductive period** lasts about 3 weeks and is intended to build general fitness. All running is at an easy to moderate pace and includes long runs. Some event-specific work is done as well, like short uphill sprints, technique, and gym exercises (no further explanation was given on these exercises).

After the introductive period ends, the **fundamental period** begins. It lasts 2 months, and over that time, mileage and intensity gradually increase. By the end of this period, the runner reaches peak mileage. During this period is when "fundamental" workouts occur. This is the long-tempo-style work described earlier. This aerobic conditioning provides the backbone of support for the race-specific training that will take place later.

For pure middle distance types (800/1500m), the duration of the long tempos is increased, but *not* the speed. In addition to long tempo runs, the middle-distance runners do some "aerobic endurance" interval workouts like 8x400m in 62 seconds with 2min recovery (for a 1:44 runner—so very slow!) As the fundamental period continues, these intervals are either extended (e.g. 600m at the same pace) or the recovery is shortened. The pace, however, is not increased. Again, the goal for the middle distance runners is <u>extension</u> of what Canova calls "aerobic power" and "strength endurance."

For the long-distance runners (5k up to marathon), the long tempo workouts are first extended, and later the speed is increased. Canova did not specify if these athletes also do intervals like the middle-distance runners. If they did, the pattern would be much the same: first increase distance and "global volume," then later, increase speed while maintaining duration. The goal is the same for 5k runners up to the marathoners.

Canova's recommendations for pace and speed of fundamental training are detailed below:

Event	Duration	Speed
800m	20-40 min	1.40-1.50x slower than Race Pace (RP)
1500m	30-50 min	1.30-1.40x slower than RP
5000m	45-70 min	1.15-1.25x slower than RP
10000m	60-90 min	1.15-1.25x slower than RP
1/2 Mar	80-100 min	1.15-1.25x slower than RP
Marathon	105-150 min	1.10-1.20x slower than RP

Let's examine a group of runners with equivalent PRs (according to Jack Daniels' Running Formula—the 800m is excluded due to the difficulty of equating it to long-distance performances) in the middle and long-distance events:

Event	1500	5000	10000	1/2 Mar	Marathon
PR	3:29	13:01	27:07	59:38	2:04:57

Because their performances are equivalent, they all have the same predicted AeT, which is 2:57/km. But Canova's fundamental pace is different:

Event	Predicted AeT	Canova	Percent slower
1500m	2:57	3:01-3:15	2.3-10.2%
5000m	2:57	2:59-3:15	1.1-10.2%
10000m	2:57	3:07-3:23	5.6-14.7%
1/2 Mar	2:57	3:15-3:31	10.2-19.2%
Marathon	2:57	3:15-3:33	10.2-20.3%

As we can see, for the short and middle events (up to 5000m), Canova's fundamental pace is 1-10% slower than the athlete's predicted AeT and as the distance increases, the fundamental pace slows down. This is likely because, as the distance of the focus race increases, the actual AeT becomes too close to race pace (being nearly equal at the marathon). Since a good deal of work at or near race pace will happen in the special and specific periods, this training must be more backed off. Recall that fundamental training is meant to <u>support</u> the later race-specific work. Even though it is backed off of the athlete's "true" aerobic threshold, these fundamental training sessions still bolster the athlete's aerobic base. For the shorter-distance specialists, it pays to focus more intently on approaching the AeT (though it is important to note that the predicted AeT is the *upper limit* of the pace in these workouts). Canova's math implies it is better to be conservative when approaching the aerobic threshold and that crossing over it will do more harm than good.

After the conclusion of the fundamental period, the athletes gradually transition into the **special period**. The special period is focused on developing both the speed and endurance for the event, but never both at the same time. During the special period, which also lasts about two months, the short, middle, and long-distance specialists begin to diverge. All athletes try to maintain their mileage during the special period, so they are in a constant state of training, yet are not too tired for quality workouts. Athletes compete in races outside of their specialty; everyone but the marathoners competes in longer races, including cross-country. The marathoners compete at shorter distances, typically 10km, half-marathon, or cross-country. Workouts from the fundamental period are not abandoned; they are added to the mix of workout options during the special period.

The middle-distance (800m-5km) runners typically do one of three types of workouts: short, high-speed repeats with long recovery at 105-110% of race pace, long repeats totaling 4-6km at 92-95%

of race pace with short recovery, or a continuous fast run at around 90% of race pace for events above 1500m. The first type of workout builds speed to be able to run at the "specific" pace and the latter two build endurance to hold the "specific" pace for the duration of the race. These two stimuli are not combined until the specific period.

The long-distance (10km and up) specialists work at speeds of 102-105% of race pace for their high-speed interval workouts. The percentage is likely closer to race pace because, as the distance of the race increases, extension becomes a bigger factor than speed. Canova recommends the following for total interval workout volume for each group:

10,000m runners:	10-12km
Half-marathon:	12-15km
Marathon:	20-30km

Marathon and half-marathon runners also do a fast-paced long run as part of their special training (and will continue to do so into the specific period). Canova provides the following recommendations for long-fast runs at slower-than-race-pace in the special period:

Event	Distance (duration for an elite)	% of RP
1500m	4km (11min)	82%
5000m	8-12km (24-36min)	87.5%
10000m	15 km (45min)	87.5-90%
Half-Marathon	25km (75min)	94.5%
Marathon	45-50km (150-166min)	87.5%

It is easy to see that, for all events except the marathon, the fast continuous run in the special period is shorter and faster than the long tempo-style workouts in the fundamental period. This is an excellent example of workouts moving in the direction of race-specific extension.

The short, high-speed repeats with long recovery are designed to build biomechanical support for sustained, fast running later without incurring significant oxygen debt. During the special period, Canova is focused on a long, gradual progression towards race-pace training by building race-relevant *endurance* with long intervals and continuous fast runs and building race-relevant *speed* with short repeats. In this sense, Canova's runners build exactly the race they want to run from the ground up. Today, most American runners seem to have a more vague vision of the race they want to run (particularly in the off-season), preferring instead to improve in increments from race to race during the competitive season, and only progressing their training in one direction: moving from slower to faster workouts.

As the special period progresses, the two types of workouts (short high-speed and long moderate-speed) begin to converge. Canova describes a funnel, in which "the intensity must be extended, and the extension must become faster." At the "end" of this funnel, we have now arrived at the **specific period**. During the specific period, the volume of race-pace workouts, as well as the extension of individual repeats, is of paramount importance to all runners. Canova gives the example of a 1:44 800m runner who, during the special period, progressed to 5x400m in 50 seconds with 5 minutes of recovery. During the specific period, this workout can evolve in two directions, either adding more repeats (6x400m, same recovery) or extending the repeats (4x500m in 63sec, same recovery). True to the overarching philosophy, the race-pace workouts become the sole focus during the specific training. Athletes must be well-rested before and must recover well after. Athletes Canova coaches tend to take two or sometimes three days of easy regeneration running between workouts. These easy days usually involve doubling, but are done at a fairly easy pace—the purpose is *not* training on these days, but recovering. A typical non-workout day in Moses Mosop's 2011 Boston Marathon training schedule consisted of 60-80 minutes at an easy to moderate effort in the morning and 40-60 minutes easy in the afternoon.

For the best development, Canova believes that athletes must increase the "modulation" or day-to-day variation in distance and intensity, introducing greater stresses with proportionally greater recovery. To this end, every 3-4 weeks during the special and specific periods, he includes what he calls a "special block" (during the special period) or a "specific block" (during the specific period). These "blocks" are days on which the athlete does *two* workouts, one in the morning and one in the afternoon. Runners must take special care to arrive at a special block well-rested and to recover well afterwards.

A special block can focus solely on endurance, solely on speed, or can mix both. Canova gives the following examples of each.

For a marathon runner:

Endurance: Morning: 10km at 90% of Marathon Pace (MP) + 20km at MP
Afternoon: 10km at 90% of Marathon Pace (MP) + 20km at MP

(Sometimes, Canova will instruct his marathon runners to drink only water and eat only vegetables between these two workouts, in order force the body to utilize fat as an efficient resource.)

Mix: Morning: 10km at 90% of MP + 10km at 102% of MP
Afternoon: 10km at 90% of MP + 12x 1000m at 105% of MP, 1:30 recovery

For an 800m runner:

Morning: 30min easy run + 10x600m at 87-90% of 800m Race Pace (RP), 2min recovery
Afternoon: 30min easy run + 4x400m at 105% of RP, 6-8min recovery

A specific block, as the name suggests, incorporates a significant amount of work at race-pace. However, a "specific block" need not be confined to only repeats at goal race pace. Canova provides us with the following "specific block" workout done by Saif Saaeed Shaheen (Stephen Cherono) in 2006:

Morning: 4x1600m, 4:30 recovery:
3:56, 3:59, 3:58, 3:58

Afternoon: 2 sets of 5x300m, 30sec between repeats and 2:30 between sets
avg. 38.3 for first set of 5, then 39.0, 37.3. 37.2, 37.3, 37.0

Four 1600m repeats with roughly 1:1 recovery is a fairly common 5k pace workout and Shaheen averaged slightly faster than what ought to be his 5k pace (12:48), so this is definitely "specific training." But the afternoon session is all at 800m pace or faster. Though this specific block devotes a large amount of time to training at goal race pace (assuming Shaheen was training as a 5k specialist), the afternoon session consists of an injection of speed, resembling more a special-phase workout than a specific workout. Even into the specific period, new workouts do not replace the old ones, but are again *added* to the mix of workouts.

With the exception of marathon runners, Canova suggests that most "block" type workouts involve working a different pace range in the morning and afternoon to stimulate the body in different ways. The marathoners likely employ the same workouts both sessions because the marathon is an event of *extreme* extension—that is, increasing speed, while important, takes a back seat to extension.

Canova gives several examples of workouts during the specific period. I have transferred the times into relative paces, but left the original race times to indicate that these workouts are all designed for the most elite athletes. However, Canova does not believe that slower athletes (including females) need shorter repetitions or a lowered workload—the distance to be covered in the race is the same, so the workload must be proportional to the length of the race, not the time spent running it. Regardless, a younger or less experienced runner may do well to reduce the workload, especially on the longer workouts. It is important to note that, for the half marathon and marathon workouts in particular, an elite covers ground much faster than a mid-range or sub-elite runner, and hence, 30km at marathon race pace only lasts 88min for a 2:05 marathoner, whereas it would last 25 minutes longer for a 2:40 marathoner. When adapting these workouts, it *may* be prudent to aim for the same duration, not distance, for the fast long runs. "Race Pace" or RP is the athlete's current personal record, NOT the athlete's goal time.

800m (1:44 PR)
- 2 sets of 5 x 300m at Race Pace (RP), 1min recovery between repeats, 4min between sets
- 4 x 400m at 102% RP, 5-6min recovery
- 3 x 600m at 101% of RP, 6-8min recovery
- 1000m at 95% RP + 400 at 101% RP + 200 at 106% RP, 8min recovery

1500m (3:30 PR)
- 2 sets of 8 x 300m at 105% RP, 45sec recovery between repeats, 4min between sets
- 8 x 400m at RP, 2min recovery
- 5 x 600m at RP, 3-4min recovery
- 3 x 1000m at RP, 6-8min recovery
- 2000m at 95% RP + 1000 at 99% RP + 600m at RP, 6min recovery

5000m (13:00 PR)
- 15 x 400m at 104% RP, 45sec recovery
- 10 x 600m at 102-104% RP, 1:30-2:00 recovery
- 6 x 1000m at 100-103% RP, 2-3min recovery
- 3 x 2000m at 98-99% RP, 3-4min recovery
- 3000m at 98% RP + 2000 at 98% RP + 1000m at RP, 5-6min recovery

10000m (26:40 PR)
- 15 x 600m at 101-103% RP, 1:30 recovery
- 10 x 1000m at 101-103% RP, 1:30-2:00 recovery
- 4 x 2000m at 102% + 1 x 1000 at 107% RP, 4min recovery
- 3000m at RP + 2 x 2000m at RP + 4 x 1000m in at 103% RP, 3min between 3000 / 2000, 2min between 2000s, 1:30 between 1000s

Half-Marathon (59:47 PR)
- 7 x 2000m at 100-102% RP, 400m recovery in 2min
- 5 x 3000m at 101% RP, 1000m recovery at 85-87% RP
- 3 x 5000m at 99% RP, 1000m recovery at 85% RP
- 15 km long run at 102 % RP
- 25 km long run at 97% RP

Marathon (2:05 PR)
- 6 x 4000m at 102% RP, 1000m recovery at 89% RP
- 5 x 5000m at 101% RP, 1000m recovery at 89% RP
- 4 x 6000m at 101% RP, 1000m recovery at 89% RP
- 4 x 7000m at 99% RP, 1000m recovery at 91% RP
- 5 x 2000m at 105% RP during a 35km (22mi) long run at 91% RP
- 25 km (15.5mi) long run at 102% RP
- 30 km (18.5mi) long run at RP
- 35 km (22mi) long run at 97% RP
- 40 km (25mi) long run at 92% RP

There are two important things to note about these specific workouts. The first is that, especially for the shorter distances, most of the workouts are not extraordinarily challenging when translated to relative paces. For example, Canova prescribes 8x400m at 1500m race pace with two minutes recovery, but ten or even twelve 400s at 1500m race pace is a common high school and college workout—with half the recovery! Likewise, many college distance runners would scoff at “only” six 1km repeats at 5k pace. As with Canova’s philosophy on running close to the aerobic threshold during the fundamental period, it seems that most of the time, middle- and long-distance track specialists are best served by refraining from pushing themselves to their absolute limit in workouts. A notable exception to this is the “specific block” days, in which the difficulty is compounded by the double workouts. This is in line with Canova’s philosophy of increasing modulation—just as there are workouts and easy days, there are harder workouts interspersed among moderate ones. However, these workouts are only examples and as mentioned earlier, fitter, more experienced athletes will do longer and more difficult workouts, as they require a greater stimulus. Moses Mosop, for example, completed *two* sets of 10x400m in 59-62sec during one workout while training for the 2011 Boston Marathon. Additionally, Canova insists that workouts be continually evolving—so, taking the 8x400m workout as an example, the athlete cannot simply repeat the same workout over and over. The stimulus must change—this can happen by increasing the volume, increasing the duration of the repeat, or decreasing the recovery interval.

The second important aspect is that, in many of the workouts, the athlete is allowed or required to complete workouts at volumes and speeds exceeding the race distance and the athlete's personal record. Workouts are often done 1-3% faster than the athlete's current PR and the track runners all have workouts that simulate the beginning, middle, and end of a race, starting with long repetitions at 95-98% of race pace, followed by shorter repetitions at or just below current race pace, and finishing with one to four final repeats at up to 7% faster than race pace. More than any other, this type of workout personifies Canova's philosophy of building the perfect race from the ground up. Before an athlete flies to Europe or America to set a new personal best, he has already ran that race over and over, not only in his mind, but on the track in his workouts.

Now that Renato Canova's training philosophy has been summarized, we can examine the question of mileage for the marathon. Traditionally, it has been thought that a marathoner must always run prodigiously high volumes—upwards of 20 miles a day for the top athletes. In contrast, James Kwambi and Duncan Kibet only run 80-90 miles a week, often only running once per day. However, other elite marathoners like Martin Lel and Robert Cheruiyot maintain 135-150 miles per week. Whereas low-mileage marathoners run 60% (50 miles a week) of their mileage near marathon pace, higher-volume runners do less than 37 miles per week near marathon pace, and the proportion is *much* smaller—only 25-30% of the weekly volume.

Why is high mileage not necessary for Kibet and Kwambi to run 2:04 marathons? To answer this, we have to return to Canova's thesis—all non-specific training exists *only* to support the body's ability to do *race-specific* training. Canova acknowledges that high mileage training and long easy runs can promote capillary growth and mitochondrial growth, but he points out that this cannot continue indefinitely—once the athlete has maximized his or her mitochondrial density and capillary beds, there is no reason to continue to do high volume. If an athlete repeats the same training over and over, the result will be stagnation. Training must evolve—always, a runner must be learning to run fast for a long time. "Really, somebody can suppose that, for an athlete able running 42 km under 3' / km, RUNNING AT A SPEED OF 6:00 per Mile can be a useful training?" writes Canova. To him, high-volume training for marathoners exists **only** to support the ability to complete the long fast runs of 15-25 miles at a high percentage of marathon pace. Once the athlete can complete these workouts, there is no reason for the mileage—the focus is making the long-fast run *faster* or *longer*. Mileage must increase for the first 3-5 years of a runner's career; after that, it is not so important, according to Canova.

Renato Canova credits the inclusion of long-fast runs in long-distance training programs (incorporated into his fundamental and special periods) as the reason for faster times today in the 5k, 10k, and especially the half-marathon and marathon. While Peter Snell's 1:44 800m in 1964 would still be world-class, the 10k world record at the time (28:15) would be considered rather paltry by today's standards. According to Canova, Ron Clarke was the first to employ long-fast runs of 9.5-12.5 miles, eventually becoming able to run them at nearly 3min/km. The result? An improvement by over 30 seconds in the 10km world record.

In the marathon, the long-fast run plays an additional role—training the body to burn fats as an efficient fuel during fast running. In this case, if an athlete does a 19mi long-fast run and slows considerably after 17mi once he runs out of glycogen in his muscles, the important training is in the *final two miles*—it is only when the body is put into crisis that it can learn to burn fats as a fuel to run fast. So the real training is the last two miles—not the 17 that came before. A long slow run cannot accomplish this, because it does not deplete muscle glycogen and it is too slow to put the body in crisis. This new style of training, coupled with young sub-27:00 10k athletes running the marathon in their prime, has resulted in the surge of sub-2:07 and sub-2:05 marathons in recent years.

Clearly, Canova takes a significantly different approach to training than any other well-known coach. Bettering personal records is simply a problem of mathematics—how to sustain the proper pace for a given distance. The solution, according to Canova, is the gradual convergence of *extension* and *speed*, supported by a strong base of general fitness which enables the race-specific work. The introductory period builds general running fitness, which supports the long-fast running in the fundamental period. The extension of endurance at slower than race pace is supplemented by shorter work at faster than race pace during the special period. These converge towards race-pace work during the specific period, which is the most important work an athlete does. The race-specific work must be focused on extending *race-specific endurance*, so workouts are always progressing in this direction. Finally, Canova does not *replace* old workouts with new ones, but *adds* new workouts to the training program. "Training is not to replace, but to ADD," says Canova. Though the individual workouts that make up Renato Canova's training program are by no means new, they are organized and developed in a novel way, with a philosophical underpinning that is radically different than most coaching philosophies. But the results speak for themselves—Renato Canova has coached dozens of athletes to world-class performances and he is arguably the most successful coach in the world.

The full Renato Canova thread that most of this article has drawn from can be found at:
http://www.letsrun.com/forum/flat_read.php?thread=2959804

A note on percentages: Renato Canova calculates percentages of speeds differently than most Americans. For example, to calculate 90% of 5:00 mile pace, an American would do the following:

$$\frac{5:00}{0.90} = 5:33.3$$

However, Renato Canova does the following:

$$\frac{5:00}{100} \times 10 + 5:00 = 5:30.0$$

While the difference here is small, it can become significant in different scenarios. The logic is that 90% slower than 5:00 pace is that same pace plus 10%.