

TIMES ARE CHANGING

Can technology make you a better runner?

We asked four runners to try wrist-top coaching tools to find out. Here's how heart-rate monitors, GPS, and other gadgets helped them—and can help you—train smarter

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KELT NAYLOR, 45, UNPACKS

a stretchy black strap from his gym bag and studies it. It's the heart sensor for his new watch, and he's not sure where to put it. Naylor stands 6-foot-2 and 220 pounds with a barrel chest and a grey-black beard. He prefers lifting cases of fruit at his Southern Vermont jam-making business to any structured exercise. Until recently, Naylor saw running as a strange ritual pursued by others.

Now he's willing to incorporate a heart-rate monitor and GPS sensor into his new routine to motivate him to run. The monitor will show his pulse to help him judge the proper pacing on easy jogs and faster runs. A satellite receiver will deliver distance stats with nearly perfect metrology. Used together, the tools could get him training smarter and seeing tangible progress. But getting there is kind of a slog, and the strap business isn't helping.

In a carpeted gym locker room, Naylor sets up the unit while I wait for him, ready for our first run. After a few minutes, he emerges with the black chest sensor *over* his red-and-white baseball jersey—making him look like a moon captive from a science-fiction film. A chuckle now would uproot our tender experiment, so I calmly explain that the sensor goes underneath the clothing; that its contact with bare skin helps it pick up the electrical signals that regulate the heart muscles. "Oh, yeah," I add, "remember to *moisten* the electrodes with water or spit."

Naylor is hardly the only runner to find personal tech difficult to use. Judging by U.S. sales of heart-rate and distance-measuring devices, only a fraction of runners try them. In a market with more than 24 million participants, heart-rate monitors sell only 2.3 million units annually. In some ways, we're just emerging from the dark ages of running hardware, where only adventur-



THE FIRST STEP

Running novice Naylor employs a Garmin FR60 to keep tabs on his training via a heart sensor and distance-tracking shoe pod.

ous gear geeks appear in public wearing GPS armbands, chest sensors, and wrist-mounted microprocessors.

By and large, the majority of runners still don't get it—despite the fact that top coaches and athletes see the technology as crucial to their training programs. "Heart-rate monitors are an essential part of race success," says Marcus O'Sullivan, head of Villanova University's track program. "It's very hard for me to coach an athlete who won't wear one."

Now, to get the hardware into the hands of the masses, electronics companies are engineering devices that are sleeker and packed with more features. None have gotten more attention, or sales, than Garmin's Forerunner 405, which has sold over 500,000 units and vaulted the company past Polar in the U.S. market in distance and heart-rate tracking watches. "The heart-rate straps work better, the displays are easy to read, and there's more useful information," says Greg McMillan, an exercise physiologist and coach of elite runners. "Garmin and other companies are trying to move from simply delivering information to having the device tell you what to do."

To see how much these devices can replace a flesh-and-blood Alberto Salazar, we



The Watch List

GARMIN FR60 \$130

HR MONITOR Plastic chest strap included; a fabric strap will be available in August

SPEED/DISTANCE Optional foot pod (\$120)

FEATURES Virtual pacer provides a training partner that always runs steady splits.

EASE OF USE Simple interface almost does away with the need for a manual.

BEST FOR Bargain hunters and beginners

SEE ALSO Forerunner 50 (\$100), which isn't as sleek and doesn't have a virtual pacer

asked four real runners to incorporate them into their training. Our testers ranged from first-timer Naylor to national age-group champion Bill Dixon. Over a period of seven months, they strapped on their high-tech timepieces each time they left the house and analyzed the numbers when they got home. All of them benefited from knowing how far and how fast they went on each run, and some even received actionable advice on how to run better. More important, the watches helped our testers train more consistently and stay injury-free by peering inside their bodies to find out how hard they were working. This feedback taught them how to make every run count.

STARTING ON THE RIGHT FOOT

FOR NAYLOR, his fortysomething wake-up call came while mountain biking on the mud-slick roads of Dummerston, Vermont. “I was sweating, huffing and puffing up the hills,” he recalls, shocked at his inability to keep up with his buddies. He suddenly understood that he needed to get fitter. “I didn’t want to get into the middle-aged rut of being static and out of shape.”

So Naylor started to run. It was a logical choice given his location in the midst of miles of beautiful wooded trails. His goal was simple: run for a half hour three times a week. He didn’t necessarily want to lose weight, and he didn’t care about competing in marathons (he dubs all organized foot races “marathons”); he simply didn’t want to be a gimp on rides and hikes.

The Garmin Forerunner 405 became part of Naylor’s stick-with-it plan. If he’s going to keep running, he needs proof of his progress. Naylor’s a numbers man: He often dips a digital refractometer into 100-gallon vats of steaming apples, raspberries, persimmons, and other fruits at his 5,000-square-foot facility to identify the precise moment a mixture reaches the federal jam-and-jelly mandate of 65 percent soluble solids. On the computer, he updates elaborate spreadsheets tracking fresh berries and other ingredients coming into his kitchens against the product going out. He wants the watch to do the same for his running.

Starting our run together on a hilly trail, Naylor breezes through our first mile at 8:30, according to his Garmin—and he’s thrilled at the scientific authority of his first split ever. As the watch clicks off the distances to a hundredth of a mile, he’s curious about the accuracy. I tell him that in our tests, the 405 pulled in a signal under dense tree cover and even in a short tunnel, and it reported distances within 25 feet, often closer to 10 feet. GPS can’t get any more accurate than that due to lost positions along curvy running routes. These errors are small but constant, so I instruct Naylor to ignore the screen that gives pace early in his run; to use GPS, you have to wait for a mile or half-mile split.

As Naylor finishes, his stride looks labored, yet he sprints back to the gym. Waiting for me to catch up, he stares down at the watch, playfully shaking it next to his ear to see if it’s still working. “Bugger says two miles.” He grins. “I never ran two miles in my life. I’m kind of proud of myself.”

Postrun he sets up his watch to wirelessly upload runs whenever he enters his office and then tally the data on Garmin’s Web site. As he studies the first numbers, the GPS distances are

straightforward, but the heart rate is baffling. He posted a 173 beat-per-minute average, which the watch says is 96 percent of his maximum. Really? That’s the effort of a highly trained athlete lunging at the finish of a 5-K. This was just a modest jaunt.

The next day I call coach and exercise physiologist Jack Daniels, Ph.D., to put these numbers in perspective. He says our problem was that most fitness watches calculate maximum heart rate based on a mathematical formula. “Those age-based formulas have a wide standard deviation,” he points out, “and some runners are outliers.” Daniels has tested hundreds of athletes and found so many outliers that he now ignores the equations. For instance, a 30-year-old Olympian once showed a max of 148 beats, putting him at 72 years of age according to the watch’s formula. Daniels explains that max heart rate is merely a function of how much blood the ventricles pump with each contraction. In some cases it may be more associated with genetics than age or ability.

BURNING ISSUE

Why are calories so hard to count?

IT SOUNDS LIKE A SIMPLE QUESTION: How many calories do you burn running at an eight-minute pace? But, alas, things are not so simple. That’s our conclusion after a tester ran that pace on a treadmill for 40 minutes and tracked his supposed calorie burn with multiple devices. The treadmill awarded him 642 calories. With the Nike+ system he got 531. The Polar RS800CX heart-rate monitor said 415. And the ActiTrainer—an accelerometer, heart sensor, and sophisticated metabolic tracking device—spit out 395.

So why is there so much variability, and which devices are the most accurate? The real count was probably closest to the ActiTrainer, which tracks body motion and heart rate, says Dan Heil, an exercise physiology professor at Montana State University. As you add more information into the device, it has more to work with. Calories are burned by the mechanics of moving a given mass (your butt) over a certain grade at a certain speed, which is how most treadmills approach the problem. Factoring in heart rate further helps a device estimate calories, since highly efficient runners burn fewer calories. Yet the biggest factor is the quality of a device’s mathematical formulas. “It’s all about processing the raw data with the best statistical methods available,” says Heil. Electronics manufacturers are crunching more data all the time and purchasing geeky new algorithms from scientists to sharpen their calorie counts. Watchmaker Polar employs such inputs as resting heart rate and VO_2 max to refine its calories. Suunto and Garmin use formulas based on heart-rate variability, a measure of the time intervals between heartbeats, which in testing brings predicted calories within seven percent of the actual amount. Of course, a more accurate calorie count means you’ll have to make your peace with cheesecake all over again. —B.P.

Following the advice of a few coaches, Naylor sets up the watch with his true easy zone, an effective way of governing his speed until he learns how to pace himself. (The watch's easy zone is way too slow, says Naylor, "basically the zone I use when making a sandwich.") Mike Smith, a 2:19 marathoner and running coach, finds that heart-rate monitors are especially good for providing structure for raw beginners. "First-time runners are like little kids," he observes. "They sprint 200 yards down the street and collapse. It feels hard, they get discouraged, and they never want to do it again."

As predicted, Naylor is tired days after that first run, but at the revised pace, he soon calls to report a breakthrough: "I'm a runner.

No, seriously, I get it. I'm usually breathing too hard to enjoy myself. But last night as I shuffled down Bunker Road, my thoughts actually started to wander."

Over the winter, Naylor retreats to the gym, and we trade his Forerunner 405 for the entry level Garmin FR60, which uses a foot pod to measure distance and cadence, the number of strides

The Watch List

POLAR FT60 \$240

HR MONITOR Fabric chest strap included

SPEED/DISTANCE Optional GPS armband (\$140) or foot pod (\$130)

FEATURES Built-in program provides personalized training targets based on fitness level.

EASE OF USE Onscreen graphics make following the watch's commands a cinch.

BEST FOR Runners seeking self-coaching help

SEE ALSO FT80 (\$350) provides targets for strength training as well.



per minute. Cadence can help a runner improve efficiency and form. Many beginners take around 70 strides per minute, while most experienced runners cruise at more than 90. Over time, beginners want to gradually adjust their form to a quicker rhythm. By midwinter, Naylor clocks 73 strides per minute; a few months later, he rises into the low 80s.

One rainy day in April, I go to the gym to observe Naylor. He's running intervals on a treadmill to bring his heart to a fast 180 beats for two minutes, and then slowing to an easy pace. His form is smooth, and there's real evidence that his heart is stronger. When Naylor scans the exercise logs on the Garmin site, he can see some trends. Early on, a 12-minute pace with a two-percent incline on the treadmill put him at 180 beats. Now, he can run the same speed at 160. As the spring roads clear of snow, he even starts leading the neighborhood mountain-bike peloton on occasional rides.

TIME OFF FOR GOOD BEHAVIOR

JENNIFER PARKER, 31, has always been a runner, but not always by choice. Spend any time with the mom and homemaker, and you'll notice her family wearing race T-shirts from the 1980s. These are the legacy of her late father, an Air Force officer with a constant weekend schedule of road races and an unyielding personality. When Parker was 15, her father announced that she and her sister would compete in an upcoming 10-K. During the race, however, the sisters staged so many sit-downs along the course that they finished near last. "I'll always remember the look of disappointment on his face when he saw us cross the finish line," she says, "He never spoke about it."

Like many runners, Parker has exploited the sport for temporary ends. She found herself a single mom at 22, struggling to lose weight after the pregnancy. "I realized I had to do something to attract the kind of partner I wanted," she says. She started running regularly and signing up for local fun runs. But soon after she married the man of her dreams, her life took a difficult turn when she learned her father had advanced leukemia. After he died in 2002, Parker would burn off the emotional stress with



STAR PUPIL
Parker bridged the gap between casual runner and athlete after following the regular coaching tips provided by her Polar FT60.

10-mile runs. “I never knew how fast or how long to go,” she says. “I just got tired a lot and all my toenails fell off.”

Parker longs to take her running to a higher level, but she has no clue how to pace herself or mix hard runs with recovery jogs. So we loan her a Polar FT60 watch, with a chest strap and a foot pod (to measure pace). Within a week, her new watch starts spitting out a surprisingly insightful plan. On its postage-stamp screen, it suggests workouts in three zones—light, moderate, and hard. It assigns a quota of 5.5 total hours of weekly exercise, with the majority in the easy bucket. The light workout pace is a revelation to Parker; it was the speed she usually jogged alongside her aging dog. “Now that I’m not running full steam at every workout, I have more energy,” she says.

On some days, the watch flashes hokey messages, such as, “You have not recovered from last week, it was too hard.” Other times it says, “You did a good job. Keep it up!” So Parker begins to think of it as an adult Tamagotchi, needing constant attention or it’ll die. In the morning she runs four miles, and in the afternoon she bikes to her son’s school just to feed the watch. The blinking foot pod produces distances as accurate as GPS on long runs and more accurate in track workouts (due to GPS’s minor imprecision). If one of her exercise quotas isn’t met, she rousts her mastiff to polish off the remaining minutes. For Parker, running starts taking on another dimension. “This is the first time it goes beyond thinking about the size of my ass,” she says. “I’m running because I like seeing the progress.”

Just as the watch shows Parker how to take it easy, it shows her how to run hard. Starting in November, she runs mile repeats to fill the “hard” buckets on the screen. (Like Naylor, she has to fiddle with her max heart rate to tune the watch to her zones.) Parker runs three repeat miles keeping her heart between 80 and 90 percent of max with a two-minute rest. She looks ready to drop afterward, yet still values the first intervals she’s ever done. At the end of the week, she earns an **Excellent!** ★★ and a 🏆.

Parker is surprised at how well the watch has predicted her progress using tiny variations in her heart rate to estimate overall cardiac strength. When a highly fit person is at rest, her heart is thumping along with little fixed rhythm. Parker took Polar’s fitness test when she got the watch and it flashed: “38” and “High Fitness.” After a few months of consistent mileage and speedwork, the watch reports: “46” and “Elite.” Parker cracks up, but the apparent esteem from her timepiece intrigues her.

While a dinky wristwatch assessing your general fitness is strange, one that tells your future is even stranger. Polar claims that its fitness test can predict VO_2 max, the upper limit of an athlete’s oxygen intake. Many physiologists consider VO_2 max an important indicator of innate talent in runners. An analogy might be height in basketball; you have to be tall to be a baller, though other factors certainly impact success.

To satisfy our curiosity, we ask Patty Freedson, chair of the kinesiology department at the University of Massachusetts, to measure Parker’s VO_2 max during a treadmill test to find out if it matches the watch’s calculated metric. Freedson has performed hundreds of VO_2 max treadmill tests in her lab.

Parker looks nervous stepping on the treadmill and donning

IN THE ZONE

Heart-rate training can help you run better. Here’s how

USING A HEART-RATE MONITOR can be as complicated or as straightforward as you want it to be. The most casual application is to glance at your pulse rate midrun to keep tabs on how your body is handling the effort. “Your heart rate corresponds to the training effects you’re trying to achieve,” says Dennis Barker, coach of Team USA Minnesota. “It helps you train in the right zone.”

Most coaches focus on two zones: recovery and tempo. The first enforces muscle recovery on easy days, and the second helps runners maintain a consistent effort on quality days. (Coaches don’t usually advocate heart-rate training for track repeats because the short distances don’t show anything useful.) The recovery zone goes from 65 to 70 percent of your max, while the tempo zone is at 85 to 90 percent of max. You may have to tweak them depending on your age and your sense of perceived exertion.

The formulas that monitors use to determine your max heart rate tend to be unreliable, but you can figure it out yourself. There’s an easy way and a harder (more accurate) way. The hard way involves running 3 x 800 hill repeats at a fast yet sustainable pace. On the final 800, run the last 400 as hard as you can. The highest number recorded by your monitor should be very close to your max.

Coach and exercise physiologist Greg McMillan has an easier method for beginners to ballpark their max. Do four easy runs (meaning you can speak in full sentences) over a two-week period with a monitor on. Your average heart rate for those runs is your easy zone. You can estimate your max by simply multiplying this number by 1.43.



Why monitors make you fitter

- 1 STOP OVERTRAINING** Many runners don’t do easy runs easy enough and this hurts their fitness in the long run. Professional triathlon coach Hank Lange says, “Watching your beats per minute can serve in a terrific governor role to keep you from overdoing it.”
- 2 STOP UNDERTRAINING** Likewise, you can’t get the full benefit of tempo runs if you don’t work hard enough. Barker finds that monitors help hard workouts designed to improve your lactate threshold.
- 3 GET FEEDBACK ON THE FLY** Sometimes it’s hard to gauge your effort level on your own. It could be the wind, fatigue, the hills. In any situation, a monitor provides a pretty good picture of how hard your body’s working.
- 4 MONITOR YOUR FITNESS** Beyond furnishing the basic pulse rate, many monitors also tally the time you spend at different training intensities. This data can help you assess how your fitness is progressing and adjust your training plan as needed. —B.P.



OFF THE MARK

Trail-running champion Hammett trains in the New Hampshire woods and records his own measurements, despite what his GPS tells him.

a backpack filled with equipment that will analyze the oxygen content of the air collected in the face mask she's wearing. As she begins to run, a grad student increases the grade every two minutes. After about 15 minutes of hard running, the student hollers, "Push it! Push it!" Freedson lifts her chin to signal for the incline to be steadily raised. At eight percent grade, Parker hangs on for 40 seconds before yelling, "STOP!" through the mask.

Freedson comes back with the news: a VO_2 max of 51.2, a high number for women her age. The watch was right; in fact its calculations had slightly shortchanged Parker. "I guess I have more potential than I thought," she says. Armed with these results, Parker takes her running even more seriously in the ensuing months. By February, her watch shows that her mileage count has reached 562 miles since she started training with it, and she has maintained a good mix of easy and hard running. The next month, she registers for one of her first road races as an adult, the Holyoke St. Patrick's Day 10-K, one of the largest in New England, and runs well enough (54:19) to come in the top third of the entire field.

At the finish line, Parker smiles thoughtfully, surrounded by hundreds of runners, some wearing St. Patty's Day tees, some in green wigs, a few in green jock straps. "I wish my dad could have been here," she says.

THE BEST WAY TO MEASURE A RUN

NOT ALL RUNNERS benefit by adding technology to their routines. Just ask Greg Hammett, 31, a physical-education teacher and trail racer, whom we loan a Garmin to help him prepare for New England's Grand Tree race series. The Grand Tree is a collection of 25 trail races ranging in length from seven miles to 50, and conducted through steep mountain paths and muddy, single-track forest routes. Hammett won the series in 2005 and 2007, but to win again, he needs to choose workouts that will enhance his speed, and not produce injury or fatigue.

For years, Hammett has run the same loops in Pisgah, New Hampshire's largest state park, referring to them in his training log as "my 10-miler," "my five-miler," or "my eight-miler." He even bought a house near the trailhead so he could access the routes out his front door. But after our first few runs with the Forerunner 405, Hammett is shocked to find his "10-miler" is really an 8.65-miler; his "eight-miler" is really a 6.12-miler.

But after processing this for a few minutes, Hammett isn't so impressed. He says the real challenge in judging training load isn't the trail distances, but the vertical feet gained or lost over difficult terrain. To figure this out, we load a dozen of his runs into a software package called TrainingPeaks WKO+, which accurately calculates the elevation profile and stress on Hammett's body of each run to create a sophisticated line chart that clearly shows how his training load has steadily intensified. He will have to taper before he'll be ready for a race effort. Hammett shrugs, "My log tells me that."

One day I visit Hammett's house while he's out on an errand. His brother answers the door and chats with me while I wait. "Greg hates the Garmin," he says mischievously, and then shows me Hammett's training log. Recorded in it are his original estimated distances as if the GPS never existed. For example: "Ran my eight-miler...Tired." At the top of the page he has scrawled, GARMIN SUCKS!!!!

As Hammett explains to me later, he believes in the accuracy of the watch, but it just doesn't mean much to him. For years, he knowingly exaggerated his mileage to ascertain his overall train-

The Watch List

GARMIN FORERUNNER 405 \$350

HR MONITOR Plastic chest strap included (\$50)

SPEED/DISTANCE Built-in GPS or optional foot pod (\$120)

FEATURES Virtual pacer and downloadable courses allow you to compete against the watch or against your previous workouts.

EASE OF USE Touch-sensitive navigation is as user-friendly as these watches get.

BEST FOR The gadget-averse

SEE ALSO Tri-friendly Forerunner 310XT (\$400)



ing load for the week. It always has worked well for him. As for heart rate, he's blasé—"If I'm hurting in the middle of a hill repeat, what's it going to tell me? Slow down?" By December, Hammett has rejected, John Henry-like, all the latest electronic folderol, and put his old, beat-up stopwatch back on his wrist. And at the end of the season, despite his idiosyncratic training method—or perhaps because of it—he emerges at the top of the Grand Tree series, setting two course records along the way.

HITTING THE RIGHT GEAR

THERE ARE OUTLIERS, and then there are anomalies like Bill Dixon, 62. When the retired math professor takes the treadmill test at the University of Massachusetts, the machines record his VO_2 max at 63.2. (An excellent rating for his age would be 40.) "That's extraordinary," says Freedson, throwing her hands up. "You see 60 milliliters in high-level endurance runners who are 20 to 30 years of age."

In 2007, Dixon was ranked third nationally in his age group (60 to 64 years old) by the USATF, and his goal is to remain at the top in 2008. He is in the midst of preparing for his biggest race of the year, the Stockade-athon 15-K in upstate New York.

The Watch List

POLAR RS800CX \$420

HR MONITOR Fabric chest strap included

SPEED/DISTANCE Optional GPS armband (\$140) or foot pod (\$140)

FEATURES Running Index uses HR and speed to assess and track running efficiency.

EASE OF USE Complicated settings make it tricky to set up and operate.

BEST FOR Competitive runners

SEE ALSO The less intimidating RS300X (\$170) doesn't include the Running Index.



Despite the goofy name, the venerable contest serves as the 2008 East Regional 15-K Championships, and will weigh heavily on the national age-group rankings.

Before this experiment began, Dixon's self-designed regimen consisted of 40- to 50-mile weeks with three quality efforts. One day, for example, on the service roads above town, Dixon ran four repeat miles, each faster than the last. He was exhausted when the workout was ostensibly over. But then he saw a straightaway on the jog home, and put in one more repeat, faster still.

Dixon suspects he pays for such displays of wild oats and brings up his health during a run in early October. "I checked my training logs and found nothing but injury and long interruption." In the last few years, Dixon has been sidelined with a sore hamstring, hip, ankle, and calf. As he moves swiftly across a brilliant floor of fallen maple and oak leaves, Dixon describes a book he's been reading about the extreme demands placed on 19th-century sailors. To survive on the ship, sailors learned not to overdo it and make themselves sick. A line from the book, a Biblical reference, strikes Dixon: "A living dog is better than a dead lion."

So Dixon is ready to try anything to continue to run well, even if it means training with a heart-rate monitor for the first time. Like Naylor and Parker, Dixon has to slow down. But he requires an approach with more precision. He needs to adjust his heart-rate scores to account for outside temperature, inflating the numbers on the cold days coming up, and double-check the results to minimize anomalies that crop up due to daily changes in his physiology. To say the least, Dixon doesn't require peppy messages or gold stars from his wristwatch. Instead, we give him two professional-grade devices—Suunto's t6c and Polar's RS800CX, both costing around \$400 and cherried-out with multichannel chest straps and sophisticated foot pods.

I ask Dennis Barker, coach of several Olympic Trials finishers, for advice on moderating Dixon's training schedule. For his elite juggernauts, Barker prescribes

GUT CHECK

A running watch and some expert tips gave Dixon a better understanding of his limitations and helped him stay healthy.



JONATHAN KANTOR(2); PORTRAIT: ANTOINE DOYEN

five one-mile repeats with one-minute recoveries and a weekly threshold run at 90 percent of their max heart rate. As the weeks progress, their splits improve at the same heart-rate percentage. “Some of the guys are around five minutes per mile in early December. By the end of January, they’ll be doing those at 4:40,” he says. “When you train in the right zone, you build yourself up rather than break yourself down.”

To calculate his tempo pace, Dixon takes 90 percent of his max heart rate (measured at the university). “Setting a limit at 90 percent protects you from drifting over your lactate threshold,” says Villanova’s O’Sullivan. This is the pace above which your body’s ability to buffer lactic acid is surpassed by lactic-acid production, and you fatigue. Dixon does a workout of mile repeats on rolling dirt roads, clocking each between 6:20 and 6:40. Along the way, his average heart rate shows in bold-faced numbers and serves as a guide for each subsequent effort. As predicted, Dixon doesn’t tire himself out by breaching his lactate point, but he does feel the pace is slow. During the rest of the week, the watch keeps his recovery runs from turning into a grim march.

After a few weeks, Dixon begins analyzing the data for larger trends. He finds the software that came with the watches too complicated and retypes all of his heart-rate averages and splits

The Watch List

SUUNTO T6C \$429

HR MONITOR Fabric chest strap included

SPEED/DISTANCE Optional GPS armband (\$169) or foot pod (\$109)

FEATURES Heart rate-based Training Effect tracks how much each workout has improved a runner’s aerobic capacity.

EASE OF USE Navigation is a little confusing.

BEST FOR Runners focused on cardio training

SEE ALSO The t4c (\$239) doesn’t have an altimeter and captures less performance data.



into a spare Excel spreadsheet. Looking at the sheet, he can see that his pace has been getting faster at a constant heart rate. Initially he ran tempos at an average pace of 6:08. Two weeks later, in similar conditions, he ran 5:54. The feedback helps him recognize a training truth that is as obvious as it is elusive: The more sanely you train, the better you race.

Dixon finishes the Stockade-athon in 22nd place out of 1,200 runners with a time of 55:50. He didn’t look at the watch during the 9.3-mile race, nor did he check the splits afterward. But, back at home, he downloads all the numbers and watches his computer chart a well-executed run. The ascending heart-rate line shows how his effort grew harder and harder through the race, reaching a crescendo in the last 30 seconds. Meanwhile, the descending pace line hovers near six minutes then trends slightly faster as he neared the tape. The cadence line continues horizontally at 94 strides a minute for the first seven miles, and then ever so gradually drops to 89, which means that Dixon maintained his steady pace by lengthening his strides by about an inch as the race went on. He needs to hold onto his form as he grows tired, even when it feels like he’s taking smaller steps.

Soon after the race, Dixon learns more good news: His results have pushed him into the number-one spot nationally in runners over 60. He made it. He still uses a heart-rate monitor for tempos, and continues to ignore the bells and whistles.

Dixon’s story reflects the strong purist streak in runners, especially when compared with cyclists and triathletes whose romance with gear often begins with the bike. “Until now,” laments Jack Daniels, “all we ever had in the sport were shoes and shorts.” But while electronics manufacturers want these devices to appear as simple as installing a tachometer dial to your wrist, they still require a little interpretation to be truly useful.

Yet far from reducing every runner to a generic number, the training watches have helped Naylor, Parker, and Dixon attain more intimacy with their running. Greg McMillan sees these devices as a means to uncover your own best athlete within. “These tools can help you learn from your body,” says McMillan, “but you have to use your own brain. The idea is to find what works for you. That has to be an experiment of one.”

JONATHAN KANTOR

POWER ON THE RUN

Meet the future of feedback

NOTHING AGAINST PACE and heart-rate data, but wattage is the Holy Grail. So says Brian McDonald, engineer at Dynastream, a Canadian manufacturer of foot pods.

Here’s why McDonald and other experts think power is better than other measures. “People try to draw a lot of conclusions about heart rate, but it only gives you the input, what the athlete is experiencing,” says Joe Friel, author of *The Triathlete’s Training Bible* and part owner of the software company TrainingPeaks. “Power will show the true output regardless of wind, hills, or surface.” Cyclists have long used power meters to measure the forces applied to the pedal by a rider’s foot and judge their output in wattage. Friel says measuring the force of an athlete’s shoe on the ground would be similarly useful in running—if technical challenges can be overcome.

Good news. Foot pods that measure power are on the way. McDonald says Dynastream’s sensitive accelerometers gather more information than they’re using—including wattage. The last step is to integrate that data with wrist-top devices. He says to look for the feature from one of the company’s partners in late 2009. —B.P.