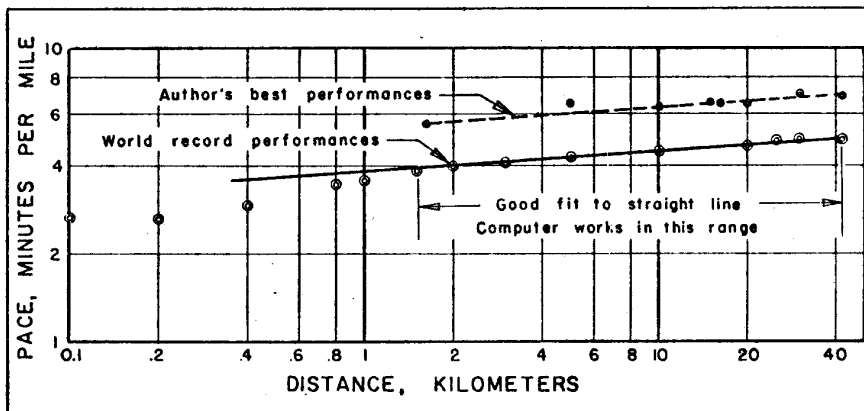


Technical Tips

Answering the needs of our readers.

TIME PREDICTING

Like many runners, I am a numbers freak. After each race, I calculate my pace, and I have a graph on which I record all of my race performances. Those that are markedly better or worse than my average show up clearly under this sort of treatment.



The idea that finally arose was that of comparing my speed with the world record for the event in which I had just competed. Although I could have used existing tables for some distances, many of the races in my area are run at odd distances at which no world records are kept.

The problem was solved like this: I first obtained all of the current world records and calculated the pace at each distance. Then I plotted the pace against the distance on logarithmic paper.

After seeing how the world-class runners did it, I plotted my own best times for a variety of distances. Naturally, the pace was slower, but more important, the straight line through my best performances was *parallel* to that of the world-class runners. This means that over my range of interest (mile to marathon) my performances, compared to world-class, were slower by a *fixed percentage*.

Was it just a coincidence? I don't think so. I have plotted the performances of some of my friends, and the same relationship occurs. It's not an exact correlation; some people are better at longer distances, some at shorter,

but *all* exhibit a trend line that is roughly parallel to the world-class line.

From the graph, one conclusion loomed. There is a reasonably simple mathematical expression that can relate the potential of ordinary runners to those of world class. After some calculation, it was found to be $F=(3785/P)$

$D^{.0689}$, in which F is the "performance factor," P is the pace in minutes per mile and D is the distance in kilometers.

The performance factor is like a batting average. On the assumption that a world-class performance represents perfection, it is assigned a performance factor of 1000. All others rate a lower performance factor, depending on the ratio of the runner's time to that of a world-class runner.

For instance, a 10-mile run made in 58:33 is done at an average pace of 5.86 minutes per mile. The 10-mile distance is 16.09 kilometers. If these values are substituted in the equation, a performance factor of 782 is the result, meaning that the runner ran at about 78.2% of world-class speed.

Runners who have calculators capable of handling exponential functions can use the equation directly. However, for those who don't have expensive calculators, a simple, cheap computer has been designed by Arrow Graphics, which solves the performance factor equation.

Using it, any runner can determine a performance factor for a race at any distance from the mile to the marathon. A runner will have races of varying quality. However, the best race will have the highest performance factor,

and knowledge of his performance factor at one distance will encourage the runner to match or better it at other distances.

For another example of the use of the computer, let's use the marathon. Many of us would like to break three hours. Using the computer, a three-hour marathon has a performance factor of 714. At this same performance factor, times and paces for some other distances would work out to:

Distance	Time	Pace
1 mile	5:29	5:29
5 miles	30:37	6:07
10 kilo	38:38	6:13
10 miles	64:14	6:25
20 kilo	81:02	6:31
15 miles	1:39:05	6:36
30 kilo	2:05:00	6:42
20 miles	2:14:46	6:44
marathon	3:00:00	6:52

All of the above performances are run at 71.4% of world-class pace, and they give a good idea of what you should be running at other distances if a three-hour marathon is your goal. If the marathon is not your goal, the computer can still be used in exactly the same way to establish your relative race qualities and to help predict performance at one distance from results at another distance.

The equation does not exactly predict the world record at any distance. Rather, it smoothes the performance curve and allows world-class times to be predicted with a single, simple mathematical expression. Of course, the calculated times at a 1000 performance factor will be very close to the 1976 world records for the distances chosen.

It may be tempting to alter or modify the equation each time new records are set. I believe this is a poor idea. As it stands, the equation does what it is supposed to do; it provides a standard for comparison and prediction. Now that it has been established, it can be used by all runners to determine relative excellence of performance.

The device is called a "Runners' Race Pace Computer" and may be obtained by sending \$2.50 to Arrow Graphics, P.O. Box 5860, Columbus, Ohio 43221.

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$$F = \left[\frac{3785}{P} \right] D^{.0689}$$

where F = Performance Factor
P = Pace, minutes per mile
D = Distance, kilometers