

# Walking and Running

by Peter Riegel

You've seen it on TV. It is late at night, and the woman is walking alone through darkened streets. Another set of footsteps is heard, and her walking pace speeds up a bit. As her unease increases her pace gets faster and faster, until finally she breaks into a run. Why did she do that?

"Walking and Running," by R. McNeill Alexander, tells us. This informative article, which appeared in the July-August 1984 issue of *American Scientist*, explains a lot of things you never knew, such as why racewalkers wobble the way they do, the forces that feet make against the ground, and the effect of tissue elasticity on performance. Zoologist Alexander discusses animals as well, and the effect of their body sizes on their gaits. (Mice don't walk, and elephants don't gallop.)

For ultrarunners, the best part of the article is the section on Energy Costs. In this section the author discusses running and walking as a means to get from one place to another while using the least amount of energy. It seems that Tom Osler was right after all. Frequent walking is a smart thing to do, at least for most people who are trying to cover a very long distance. Alexander notes that, "When allowed to choose their gaits, the horses used the cheapest gait at that particular speed." He also notes that "horses avoid the awkward, inefficient speeds at the borderlines between the preferred speeds for walking, trotting, and galloping." Well, so do people.

According to Alexander, and this is supported by others, this borderline speed, for humans, is about 5.3 miles per hour. This is just over 11 minutes per mile. It's just a bit too fast for comfortable walking, yet a bit too slow for easy running. As it turns out, it costs the competitor the same amount of energy to cover ground at this speed whether he walks or runs.

Suppose you and your twin are miraculously identical to the theoretical person. If you are, you can:

Walk at 3 mph and burn 270 calories per hour.

Run or walk at 5.3 mph and burn 630 calories per hour.

Run at 7 mph and burn 780 calories per hour.

Both of you decide to enter a 24 hour run. Your twin has heard that "even pace is the key" and he runs for 24 hours straight at 5.3 mph. He covers 127 miles. Not bad. You have listened to Osler,

and decide to combine running and walking. You walk for 10 hours of the 24 at 3 mph. You run the rest at 7 mph. You also cover 127 miles in 24 hours. However, during the run your sibling burned 15,100 calories, while you burned 13,600. He is dead shot at the end, while you are kicking yourself for feeling so good.

You ought to have something left; you used 10% less energy than your twin while covering the same distance in the same time.

You decide to try again, except that you intend to walk less. On your second try you walk for only 7 hours of the 24, at 3 mph, and run the rest at 7 mph. This time you cover almost 140 miles, while burning the same 15,100 calories that your twin used in covering 127 miles. Like he was, you are now totally shot, but you covered 13 more miles than he did by avoiding the "even pace" at an inefficient gait.

It would certainly be handy if we had instruction manuals for our bodies. The graphs that have

been developed show only average, approximate values, and it is unlikely that many of us will find that our bodies are biomechanically identical to those theoretical ones. So we must experiment, and try different pacing schemes to find the one that works best for each of us.

Most of us have a favorite running speed that allows us to eat up miles in a fairly effortless way, and we each have a comfortable walking pace. Combining the two in a way that allows us to finish the race, in the fastest time possible, with the tank on "empty," is the goal.

Not everybody has to walk. Yiannis Kouros, it is reported, ran every mile of the 635 he covered in his record-breaking six-day run. He took breaks, it is true, but he ran his miles. Top racers walk less than most ultrarunners, perhaps because they have greater reserves of strength, and can afford to be inefficient. The prizes are not awarded for efficiency, but for fast running.

Only in a race of very great length will we see the top contenders spend much time walking. It will be interesting to see what happens when a highly competitive transcontinental race comes about. Will the top competitors walk? I expect so, but time will tell.

