**Does Drafting Help In Running?**

**It does, which explains why it's so hard to lead a middle-distance race from gun to tape.**

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Everyone knows that drafting is crucial in cycling. (The finding from [one of the classic studies of the topic](http://www.ncbi.nlm.nih.gov/pubmed/2318782): at the back of a group of eight riders cycling at 40 km/hr, you consume 39% less energy than you would on your own.) But what about running? Wind resistance is much less important at slower speeds, so does it make any difference? And if so, how much? I was discussing this recently with an old friend, [McMaster University coach Rory Sneyd](http://www.marauders.ca/coaches.aspx?rc=139&path=mtrack), and decided to dig up some data. The first question is how much energy air resistance actually costs you. There have been a few studies with different estimates, but the one that seems most reliable is [this 1980 Journal of Applied Physiology paper](http://www.ncbi.nlm.nih.gov/pubmed/7380693):

*The energy cost of overcoming air resistance on a calm day outdoor was calculated to be 7.8% for sprinting (10 m/s), 4% middle-distance (6 m/s), and 2% marathon (5 m/s) running.*

These are significant amounts of energy -- and of course, if you're running into a headwind, the cost is significantly greater. A speed of 5 m/s is about 5:22/mile, so it's safe to assume that drafting isn't really relevant at speeds of, say, 7:00/mile or slower unless there's a significant headwind. The second question is whether you really benefit from tucking behind a runner in front of you. The canonical study here was done by Griffith Pugh -- best known as the physiologist on the first successful Everest mission -- in 1971.

This shows oxygen consumption (which is basically equivalent to energy consumption) for a runner running alone at 6:00/mile in a wind tunnel, versus the same runner running at the same pace one meter behind another runner in the wind tunnel. It's pretty clear that there's a big energy saving from drafting. Pugh runs some calculations to determine that **at 4:30 mile pace, drafting one meter behind another runner *on a still day* saves about 80% of the energy you'd otherwise spend fighting air resistance**. That corresponds to about **1 second per 400 meters** at that pace, and more on windy days.

The numbers to pay attention to are the percentages, which tell you how much air pressure you'd feel at that point compared to the value taken in front of the subject. (Ignore the negative value -- it essentially just means "zero" to within the limits of the measurement.) You can see that between 40 and 80 cm behind the runner, there's virtually no wind felt at all. At 100 cm, there's a very slight increase, but you're still well shielded -- and this is probably near the limit of how close behind someone you can run anyway. You can also see that moving to the side of the runner exposes you to pressure quite quickly: 40 cm to the side sees a slight increase, and at 70 cm to the side, you're getting pretty much no benefit.