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Running Economy & Running Form

Two cars with the same size gas tank going the same speed, the one with the most economical design will take longer to run out of gas. For Trathletes interested in racing being more economical when swimming, biking, running results in finishing a race strongly with energy to spare.

Running is the most natural of the three, Triatlon sports. Running has a consideration that doesn't play in cycling or swimming. There is a period of time when nothing is on contact with the ground; therefore there is a period when no force can be expended to push your forward. Whereas with swimming, and biking there is always the opportunity to use force to push forward. Landing from the period of no support uses energy that is then unavailable to more you forward. This is one reason why heavier runners do not excel at running. They spend a greater percentage of their energy decelerating the mass and just staying erect. Everything you do in swimming and biking should somehow propel you forward.

Why are some individuals more efficient at walking/running than others are? Some individuals seem to do more work for less energy cost. There are multiplicities of explanations both physiologic and psychological. There are conflicting opinions evident in the scientific literature related to running economy. Researchers have examined a variety of physiologic and kinesological explanations of economy of running including: biochemical energy transport systems; muscle fiber recruitment; genetic selection; weight of shoes/cloths; length of stride; cadence of strides; aerodynamic position; weight of legs; and an individuals ability to coordinate the switch of mechanical energy systems from potential energy to kinetic energy.

In a classic study by N.C. Haglund (Nature 1995) he discovered African woman carrying head-supported loads are able to conserve mechanical energy by improved transfer of energy during each step, back and forth between gravitational potential energy, and kinetic energy (energy of motion). The ability to coordinate a smooth switch of mechanical potential energy to kinetic energy is a sophisticated way of saying that one's running form is coordinated and efficient.

Can a runner change his running form to become more efficient? Can a runner learn to coordinate the switch from of mechanical potential energy to kinetic energy in a better way. According to PE Martin (1992) our ability to improve economy through biomechanical training remains scientifically unanswered. However, Rick Niles author of *Time Saving Training for Multi-sport Athletes* who reviewed and analyzed the

literature on running economy takes a more positive opinion and states correcting awkward faulty form is the quickest way to make your running more efficient.

Good athletic form is basic to all sports. The most fluid and graceful athletes are simply doing less work. All the energy and movements are going directly into moving forward. Awkward movement is extra and wastes energy.

Practice and repetition of correct form is critical process in order to accomplish a goal of becoming more efficient and economical. Practice and repetition of incorrect or faulty form is detrimental. When you learn correct form nature takes over you move forward in the easiest manner possible.

Currently delineating what is correct or faulty running form is more art than a science. What is thought to be optimal running form is based on limited data, anecdotal information, and expert opinion.

In order to truly look like the silken, smooth champion running we likely already have in our minds eye, it is helpful to actually see someone running who has good form. Watching Olympic Champions on TV is a potential source of good running form. Observing and mirroring the running from of training partners is also a source of model of optimal running form.

Most runners have an idea about their individual running form based on what it feels like when they run. Runners can actually see what their running form looks like by observing their shadows when running, looking at still photos taken when finishing a road race, or looking at mirrors when running on a treadmill. Visual feedback facilitates learning correct form. Using a video recording is an excellent way to provide visual feedback about running form. Better yet, a video playback unit, which is capable of slow motion, gives even better feedback.

Using a slow motion video can help identify common faults in running form including: over striding, unbalanced arm swing, elevated or tight shoulder, tight elbows/hands, excessive forward lean of the trunk, excessive bouncing up and down motion, excessive upper-body rotation, and head tilting.

In my experience awkward asymmetrical faults or unbalanced movements observed when running are frequently relate to underlying structural faults related to previous trauma, injury, or weak body part. Of course underlying structural faults should be addressed in addition to learning correct form.

Unlike the analogy of a more economical car, humans do not have the option of buying new more economical body, but we should be able to improve our coordination and running form so that we are a more economical running. Using slow motion video is a good way to analyze and get feedback of running form in order to become more economical.