Running Form and the Three Natural Forces:
How to Maximize Running Economy

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There are three forces that are external to our bodies and yet they act on us at all times. The combination of our posture and the actions we take with our bodies (or our movement patterns), and how we apply these to our running, will determine if these three forces work for us or against us. Perhaps better stated: we work with the forces to take advantage of benevolent help they offer us, or we work in such a way that the forces conflict with our attempt to move. This is like driving a car with the hand brakes on. We get used to the feeling of the hand brake being on and we fail to notice the drag it creates on our bodies.

One of the goals of improving the way we direct ourselves and put ourselves into our running form to maximize efficiency is to learn about these forces, how they operate on us, and what we can do to work in harmony with them.

The first is **GRAVITY**. The main concern here is good bodily alignment or what is commonly known as good posture. When our body segments are stacked up with little or no deviation from what the anatomists call the postural plumb line, the muscles of the body work less

to hold us up and the structural solidity of the skeletal system bears more of the weight. At this point we feel lighter because what we sense as heavy has more to do with the density and contraction of our large postural muscles then the numbers we read off the scale. And in good alignment our muscles relax into a tone that is sufficient to deal with the slight sway that is inherent in the precarious stance of the two-legged creature. Not the excess tone of the postural muscles associated with holding a heavy, out of alignment skeleton up. You could think of muscles that are holding up a posture that is out of alignment as guy wires that are taut in a constant effort and strain against the pull of gravity.

Another factor is the system of antigravity reflexes that operate in a well-aligned relaxed body with resilient muscles. In certain kinds of wildlife such as deer this can be seen in the bounce and resilient movement when the animal is startled. It can be seen as "float" in a horse. In a good runner it might be characterized as lightness. Some of these reflexes are primitive, seen in the first few weeks and months of infancy and then over ridden by a developing nervous system. Some are embedded in skeletal muscles and operate with stretch. With over contracted muscles, meaning muscles that bias towards tightness and density, the reflex system, which is dependent on proper alignment and muscular resiliency, is disadvantaged. Without the benefit of a fully operative reflex system we work harder and tend to feel heavy.

Applying a well aligned and relaxed body to running, and getting a mild forward lean into the form to establish a gentle falling action, the runner can

take advantage of the gravity factor, with a continuous falling and catching effect. Any break in the postural alignment will diminish the efficiency by either causing a disruption in the energy flows of the body itself or by inhibiting the freedom of movement at the joints. This generally results in over striding, breaking and unnecessary pounding.

The second is **GROUND REACTION**. One of the Newtonian Laws of physics states, "for every action there is an equal and opposite reaction." In which case our relationship to the ground in running should be by definition of extreme value to us. More often it is referred to as pounding and becomes the bogyman of joint dysfunction and degeneration. When in reality, the forces of impact carry a potential that can be effectively transmitted through the resilient body. This potential is realized via natural elasticity in the form of spring, rebound, additional quickness and lightness.

For ground reaction to be restored to its beneficent role in running certain principles of body use must be honored. Muscles must be resilient, the right measure of contraction and relaxation must be present, and there needs to be proper use and balance in the muscular system. If for example there is a bias towards knee extension in the leading leg because of too much quadriceps muscle firing, there will be an overstriding and breaking action with each step. The knee takes the brunt of this, and pounding will be the fall guy.

Overuse of the ground is typified by a person who beats the ground with a heavy footfall to get more ground reaction. This is an attempt to get more power from the ground because of not getting the power from the muscles of the core and pelvis. An example of under use of the ground is in overuse of the smaller muscles of the leg and thigh as occurs in forefoot strikers. When the smaller muscles of the leg and thigh are called upon to produce the kind of forces necessary to propel the body forward, they will tend to become over contracted and lose the resiliency that would attenuate, distribute, and transmit the forces of ground reaction. This type of running style will result in a variety of foot, ankle, leg, and knee injuries with increases in mileage and age.

MOMENTUM is the third of the external forces. A body set in motion will remain in motion until a retarding force acts on it. We know that there is friction that is external to the body in motion. Wind, gravity, variations in terrain, will all tend to retard movement, which we will feel as increase in effort. However the largest retarding forces will be the resistances we offer to ourselves in a body that is overly tense due to tight muscles, a result of muscular imbalance, poor postural alignment, over contracted non resilient muscles, biomechanical form considerations, etc.

Another factor is how we adjust our form in relation to the terrain we are on, to the changes that we are confronted with as we run. For example a longer stride on flat areas will help develop and maintain the momentum, but on an

uphill the longer stride will result in contraction of the hamstring and calves, causing tension in the back of the leg in general and a loss in momentum on the down hills. The science of terrain adjustments, all the subtle changes you can make in your form, is a huge aspect of getting, keeping, and being helped by momentum.

Being centered in the body and moving as one unit, all parts, muscles, and body segments contributing to the effort in an integrated and harmonious way helps develop and maintain momentum in running.

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