



concentrating your PEDAL FORCE

By Matt Russ

Propelling yourself on a bicycle is a relatively simple process. You may either pedal with greater force, more pedal velocity, or both to achieve greater speed. In order to accomplish this you must first transfer your body's energy to the pedals. How much of this energy you transfer is determined by your efficiency, and there are many ways to increase it. It is possible to be a fit and powerful athlete, but not necessarily a fast one if you are inefficient.

PEDAL INTERFACE

First, let's look at how your foot connects to the crank arm. The widest part of your foot should be roughly in line with the pedal spindle. Some cyclists prefer to be slightly fore or aft of this point, but generally the more efficient position is in line with the first metatarsal head or beginning of the big toe. The more solid the pedal platform, the more force you will transfer to the crank arm. A carbon-soled shoe is very rigid and will transfer more power than a rubber-soled shoe. A loose shoe will drain power so make sure your straps are tightly secured. If your foot is canted to the inside or the outside as you pedal, more force will be directed medially or laterally. This can be tested and corrected using shims under your cleats to level your foot, but do not attempt this without consulting a knowledgeable professional first. The rotational angle of your cleats should also match your natural biomechanics. Some pedal systems have a high degree of "float" built into them and it is not necessary to adjust for rotational angle. If you are a "pigeon-toed" or "duck-footed" cyclist, it is important to not lock your foot in a position that is contrary to how you are naturally built. This will cause compensation in your pedal stroke, wasted energy, and perhaps an overuse injury.

PEDAL FORCE

Optimally, force should be applied perpendicularly to the crank arm. Any force that is applied in a different direction does not directly work towards your speed. Most pedal force is produced from the top to bottom of the pedal stroke. An efficient cyclist will begin producing force at one o'clock or just over the top. If you attempt to produce force by "pulling up" on your pedals through the bottom of the pedal stroke, one leg will fight the other. Through the bottom of the pedal stroke you simply need to un-weight the pedal so that it can move at equal velocity to the crank arm on the upstroke. Use the hip flexors to accomplish this. They are the muscles you touch when you put your hands in your front pockets. Some energy is lost in the pedaling cycle, and some energy is used to stabilize your joints to produce force, but the objective is to direct as much energy as possible to the crank arm.

CYCLING FORM

An efficient cyclist works within the limits of his or her own natural biomechanics to optimally produce pedal force. What does this mean? Everyone is different and will have a slightly different pedaling style based on how they are built. Cyclists are wide-hipped, duck-footed, sway-backed, over-pronators, etc. It is important to not attempt to correct something that is natural as injury can occur. Keeping this in mind, there are ways to put more power to the pedals. Make sure your heels are not moving back and forth as you pedal. A small degree of float is needed in the pedal stroke, but if the heel moves excessively towards or away from the crank arm, energy is wasted. Dropping your ankles as you pedal or pedaling with your feet (ankling) does not produce an effective force. The muscles of the lower leg play an important stability role, but the bigger muscles of the upper leg are the prime force producers. "Knees out" pedaling is another more common form issue. Your knees should track roughly within a line from the hip to the foot. If your hips "bob" in the saddle while pedaling, it is again more lost energy. The hips should be blocked and level. A straight back is a more stable platform for force production than a rounded back.

There are, of course, times when you will use the muscles of your upper body to assist in force production; but if you maintain a tight grip on the handlebars you waste calories that could be going to your legs. Overall, pedaling form should be fluid and the body relaxed. A relaxed body absorbs road shock and vibration, whereas a stiff body fatigues from it. Video analysis is a great way to identify form issues.

FIT

Your bike fit must consider your comfort, aerodynamics, and power. The ratio of these ingredients will depend on the type of cycling you are doing, your biomechanics, and competitive level. A poorly fitted bicycle, however, does not allow you to produce force effectively. A seat that is too high, low, or positioned too far forward or back will affect power. A cockpit that is too close or stretched will be uncomfortable and may cause neck and shoulder strain. A bike that is too big or small will not be nearly as effective as the proper frame size. Only when you are on the right bike, comfortable, and lined up correctly, can you really put the power to the pedals.

All of these variables affect how you concentrate your energy to that small area near your big toe. Training or adjusting for cycling efficiency is "free speed." You don't have to work harder, just smarter.

Matt Russ has coached and trained elite athletes from around the country and internationally for over ten years. He holds a Level II Certification from USA Triathlon, an Elite License from USA Cycling, and is a licensed USA Track and Field Coach. Matt is head coach and owner of The Sport Factory, and works with athletes of all levels full time. He is a free lance author and his articles are regularly featured in a variety of magazines and websites. Visit www.thesportfactory.com for more information or email him at coachmatt@thesportfactory.com

