THE KICK

What makes a good kick?

Big flat feet work the best. They push the most water. The angle at which the foot pushes against the water is also a critical factor. The farther the foot flexes forward, the more propulsive the kick will be. We cannot change the shape or size of our feet, but we can change this angle. Small differences in the angle make extraordinary differences in how well the kick works. Let's look at some feet. For a kick to be effective, the swimmer must be able to position the top of the foot at an angle that will displace water rearward. This results in swimmer being pushed forward. To do this, the top of the foot must be at an angle above the horizontal.

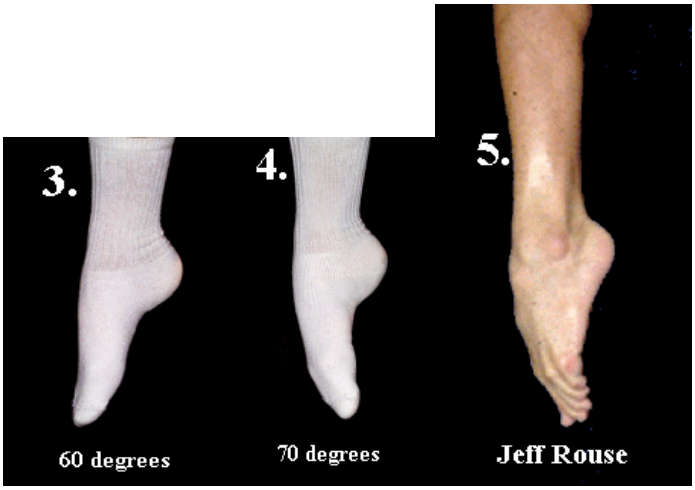
When the foot at left kicks downward, the top of the foot pushes water downward, not back. To position the top of this foot so it can deflect water back, the swimmer must first move the upper leg down and bend at the knee. Then the top of the foot will deflect water back but the drag caused by the thigh moving down can cancel out much of the propulsion produced. The more the leg must come down, the less effective the kick will be.

The forward flexing of the foot is called plantar flexion. For reference, picture #1 shows zero degrees of flexion. 60 degrees of plantar flexion places the top of the foot parallel with the front of the lower leg or shin. Swimmers with a range of more than 60 degrees will have an effective kick. Swimmers with less than 60 degrees will have a less effective kick.

How do different ranges of motion affect the kick?

Picture #2, a swimmer with 40 degrees will have a kick that is of little or no use. To place the top of the foot at an angle that is propulsive requires significant bending of the knee. When the knee bends, the thigh moves down and

causes enough drag to cancel out most or all of the propulsion from the top of the foot. The kick is not worth doing. These swimmers love pull buoys! Swimmers with less than this range of motion, when kicking flutter kick on a kick board, can actually go backwards.



Picture # 3. 60 degrees. This swimmer must bend some at the knee to get propulsion. This kick will be reasonably effective when sprinting (see below for explanation) but will not work well for longer distances (100 yards or more). This swimmer will be able to swim high speeds for short distances with the stiffer Red Zoomers fin but will have difficulty using it for long distances and will tend to drag the legs. The Blue fin will work best.

Picture 4. 70 degrees. The pictures with socks are my feet, taken July 1998. I have a good kick. When I was in college, I had a very good kick. My feet helped push me to an American record and an NCAA championship in swimming. I started in Masters swimming in 1979 after fifteen years out of the pool. My ankle range of motion had decreased to that which I am demonstrating in Picture 3. My flutter kick for crawl stroke and backstroke was very poor. It seemed to take so much more effort and produce so much less than when I was in college. In 1989-90, I developed **the Rack**, ankle stretcher. I stretched my ankles for several months and achieved a range shown in picture #4. My kick helped me to many National and world Masters titles. I have retained that range of motion shown in Picture 4 with only occasional stretching.

Picture # 5. This is the foot of Jeff Rouse, Three Olympic Gold Medals. World records. He is probably one of the fastest kickers in history. His range of motion is approximately 75 degrees. The world's fastest freestyle swimmers, American, Gary Hall Jr., world record holder, Alexander Popov, Olympic great, Mark Spitz, have ranges of motion well past 75 degrees. If you look closely at Jeff's foot, you will notice that the bottom of his foot is a flatter surface than mine. It pushes on the water better than the more hollow underside of my foot.

I don't believe anyone has been very successful in changing the shape or size of feet, but you can make improvements in the plantar flexion angle. As you can see above, ten degrees is the difference between a kick that barely works and one that is fantastic.

The next sentence is very important so get ready!!!

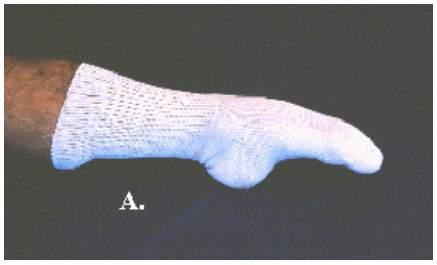
> **For each degree you can get your feet to flex past 60 degrees, the kicking movement will require less effort to perform and the kick will produce more propulsion. That means more speed for less work. That is a big deal. It is also very unfair, but that is the way life often is.**

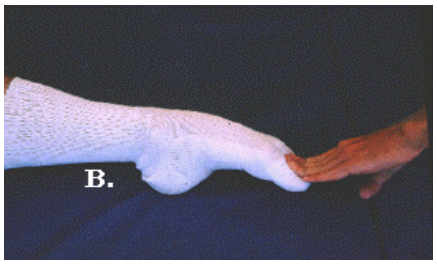
Stretching devices do not generally captivate swimmer's imaginations, but ankle stretching is a very sound idea and the Rack is a very simple, strong, effective device. It works.

Why does the 60 degree foot work pretty well when sprinting and not well at slower speeds??

For this foot type, to get the best propulsion possible from the kick, it is necessary to contract the calf muscle (lower back of the leg) to plantar flex the foot as far as possible. This moves the foot to approx. 60 degrees. When you kick very hard, the water pressure against the top the foot will bend the foot a little farther. The water pressure is only great enough to have much effect if kicking VERY hard, when sprinting. For this period of time the swimmer has a foot which is functioning as if it had a couple additional degrees of plantar flexion. Even a couple degrees is a huge difference. At lower levels of kicking intensity, the water pressure provides almost no benefit in propulsion. In the pictures below, I flexed my foot as far as I could with my own muscles (picture A). Then I asked my son to

press on my foot with his fingers, lightly in picture B. and more forcefully in picture C, to demonstrate that an external force easily flexes my foot farther than I can flex it myself.





Another benefit of feet with plantar flexion of 60 degrees or more: If the foot can be flexed to 60 degrees with relative ease, then the pressure from the water against the top of the foot will keep the foot plantar flexed to an excellent propulsive angle. It is therefore not necessary to contract the calf muscle to flex the foot forward. (THIS IS ANOTHER BIG DEAL!!! You will notice that I try to point out the important parts so you don't miss them.)

The calf muscle is a very large muscle. A sustained contraction to keep the foot flexed requires substantial blood flow. If it is not necessary to contract the muscle then the blood flow which would have been used is available for upper body use. More blood flow to upper body means faster swimming. I hope some of this has gotten your attention and caused some excitement. These are not just theories. They have been tested and have proven to work. Ankle stretching is a sound practice. I cannot predict the amount of improvement for each individual, but most everyone makes some progress. Some make a lot. ANY improvement is of great benefit. Many people can get past 60 degrees and get to the point of more propulsion for less work. The number of people who can reach 70 degrees + is smaller so not everyone can gain access to the extraordinary benefits at this range of motion, but it is worth a try.