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Rate Your Shoe

The "perfect shoe" may not exist, so Dr. Lon Kilgore offers up a system designed to help you select the best footwear for any sport.

By Dr. Lon Kilgore **January 2011**

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There has been a tremendous amount of online chatter about what shoe to wear while CrossFitting. Hundreds and hundreds of expert and not-so-expert opinions are floating around the Internet. This person recommends one model and brand of shoe because he or she likes it. This person recommends this shoe for running, this shoe for lifting, and this shoe something else. This person says not to wear shoes at all.

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Who is right?

As opinion-rich as this area is, we have very little objective data about what the perfect exercise shoe is like. This is the Holy Grail of exercise footwear: the elusive multi-purpose exercise shoe. There is also virtually no means of figuring out what type of exercise a shoe is good for and if a shoe made by manufacturer X is similar to a shoe made by manufacturer Y. Until everyone is comparing things to a single standard, headway in finding the perfect shoe cannot be made. Until there is such a consensus, most exercisers will do what they have always done: wear whatever shoe they want to. Most likely it will be a heavily cushioned "running" shoe because it is comfortable, available and heavily marketed using high-profile celebrity athletes.

What is presented here is a simple means of selecting the correct shoe for your training, a more formalized and quantifiable version of my advice to trainees for the past two decades. Its intent is twofold:

1. Make the consumer non-reliant on the advice of random experts.
2. Give exercise professionals a framework to help them develop a means of identifying shoes to recommend to their trainees and provide these trainees with a compelling rationale as to why they need them.

Rating Definitions

Sole Compressibility is the degree to which the complete shoe sole will deform under pressure. A rock is non-compressible; a marshmallow is compressible. To assess compressibility, hold the shoe upside down in your hands, fingers wrapped into the ankle opening and thumbs lying over the heel area of the sole. Squeeze your thumbs into the sole as hard as you can (Figure 1). If there is no give (like pushing your thumbs into leather-covered wood), that would warrant a rating of 5, or "hard." If compression is significant (greater than 1.5 centimeters), that would warrant a 2. If the sole completely compresses (like inexpensive foam flip-flop sandals), a score of 1 is appropriate. Compressibility is a problem for repeatable technique with any activity, but especially for weighted exercises. In weighted exercises like the squat, deadlift, clean, etc., the ability to simultaneously control one's body and the weight lifted is hampered (Figure 2). If the combined mass of the body and barbell cannot be effectively managed, motor control (doing the exercise correctly) and maximal force generation (lifting as much as possible) cannot occur. This slows the rate of learning exercise technique and improving performance.

Sole Flexibility is the resistance to deformation from forced bending or twisting (Figure 3). To assess this, two tests are done. First, grab the toe of the shoe and bend it

The Rating Scheme

Objective Measures							
Sole Compressibility							
	Soft	1	2	3	4	5	*Hard*
Sole Flexibility							
	Flexible	1	2	3	4	5	*Inflexible*
Anterior-Posterior Elevation							
	Elevated Heel	1	2	3	4	5	*Flat Heel*
Tarsal-Metatarsal Support							
	Absent	1	2	3	4	5	*Present*
Subjective Measures							
Comfort							
	Uncomfortable	1	2	3	4	5	*Comfortable*
Visual Appeal							
	Unattractive	1	2	3	4	5	*Attractive*

back toward the heel. The shoe should bend at the area of the ball of the foot. If it bends easily (as in an inexpensive foam flip-flop sandal), the score is 1. If it takes a few pounds of pressure to create the bend, a score of 5 is appropriate. The second test is to hold the toe immobile and rotate the heel (turn it like a screw driver). If the shoe can be completely twisted on itself, it scores a 1. If it twists less than 15 degrees, it is a 5. Average the two scores to get the single flexibility score.

Anterior-Posterior Elevation is the amount of height added to the heel, ranging from "flat," where the heel and toe have equivalent materials under them, up to "elevated," with 1 centimeter of thickness at the toe increasing to 3.75 centimeters (1.5 inches) at the heel. This is a simple visual inspection in some instances, but the structure of many shoes obscures where the sole of the shoe actually is relative to the decorative external features. If one desires to be accurate, two small rulers are needed, one placed vertically on the inside of the shoe and one placed vertically on the surface on which the shoe rests (Figure 4). The difference in height between the two is the thickness of the sole. Do a measurement at the furthest point of the heel and one at the ball of the foot. No difference between the two values indicates a flat sole that is scored as a 1. A forefoot measurement of 1 centimeter and a heel height of 3.75 centimeters would rate a 5. As the angle decreases from there, the scores decrease as well.

Tarsal-Metatarsal Support is the presence of devices that reinforce the arch of the foot to include: six to nine lacing eyelet pairs, additional stitching along both sides of the arch, additional materials (often a logo) sewn into the upper material along both sides of the arch, a metatarsal strap across the mid-foot, an upper constructed of stretch-resistant material, a molded arch support included as part of the insole. The number of lacing eyelets is important as eyelets customize fit and support to your foot. Fewer eyelets provide a low score. The stitching and logos mounted on the side of the shoes are supportive elements of the shoe, not just decoration. Several rows of stitching and a sewn-on logo add to the score. A metatarsal strap is desirable on shoes that are going to be worn during lifting or throwing, so its presence adds to the score as well. Virtually all shoes include some type of built-up arch support as part of the insole. If the arch support is extremely compressible when you press on it, it gets a low score. If it is firm (but not rock hard), it gets a high score. Average these observations to obtain a single support score.

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Figure 1:
Testing compressibility requires a little effort.

The sole of a foam flip-flop sandal (top) is easy to compress by pinching, earning it a 1.

For other shoes (running shoe—middle, lifting shoe—bottom), a hard squeeze is required to discriminate between a 2 and a 5.

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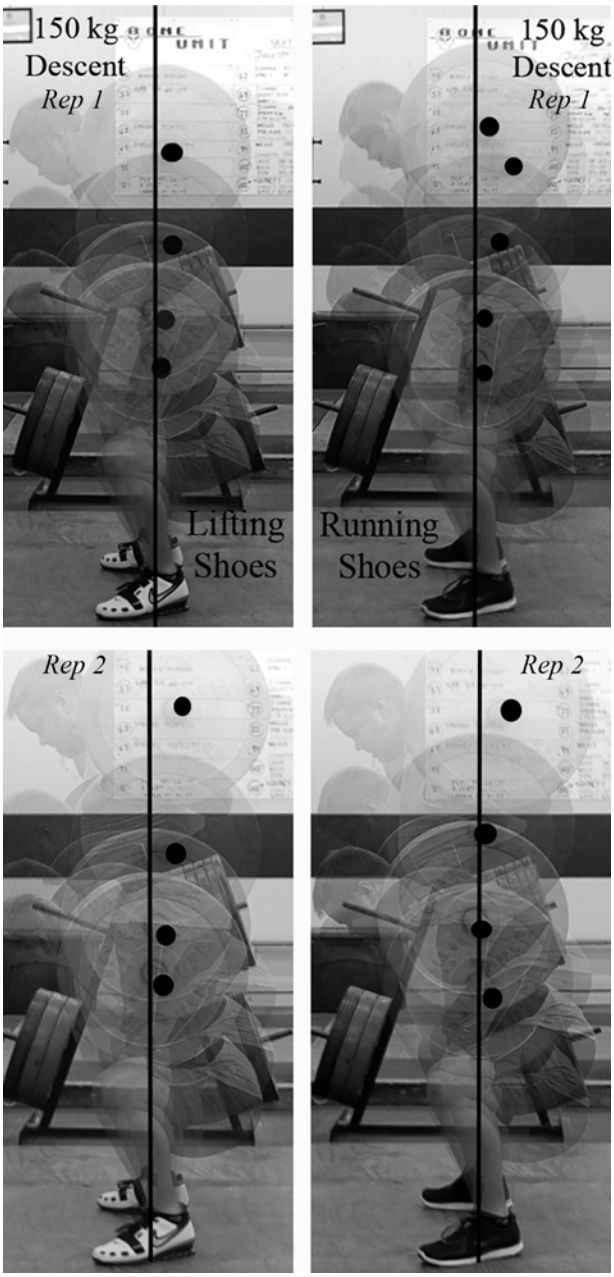

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Figure 2:
A non-compressible-soled shoe (left) allows the trainee to control the motion of the bar in an efficient manner (linear movement), whereas a compressible-soled shoe (right) reduces the perception of where the body is in space, thus inducing extra and inefficient movement (curved bar trajectory). Note the similar bar path between Repetition 1 and Repetition 2 with the lifting shoes (left top and bottom) and the dissimilarity between repetitions one and two with the running shoes (right top and bottom).

Comfort is a widely variable entity and refers to an individual's sense of ease and fit when wearing a shoe. One should always strive to use shoes that produce the personal perception rating of 5. This is quite dependent on selecting the correct size of shoe and ensuring at least one adjustable means of tarsal-metatarsal support is present.

Visual Appeal is an even more variable concept than comfort. The basic rule is that if they meet all other requirements for being good training shoes, are comfortable to you, and you don't mind being seen wearing them, then they are OK to buy.

How to Use the Rating Scheme

Every type of exercise activity will have a profile of characteristics fairly unique to it. What follows is a set of suggested values that are intended to aid in shoe selection for specific purposes in four cases and for general purposes in one case.

There will be some variation in shoe manufacture that may make finding absolute template profile matches quite difficult. This is expected. You just need to get as close to the objective measures profile as possible.

Template Profiles	C-F-E-S
Desirable Weightlifting Shoe	5-4-2-5
Desirable Powerlifting Shoe	5-4-4-5
Desirable Running Shoe	4-3-4-4 (specific to forefoot/midfoot strike—10-km distance or less)
Desirable Walking Shoe	2-2-2-3
Desirable Multi-Purpose Shoe	4-3-4-5 (combined lifting and running—10-km distance or less)
C = Compressibility F = Flexibility E = Elevation S = Support	

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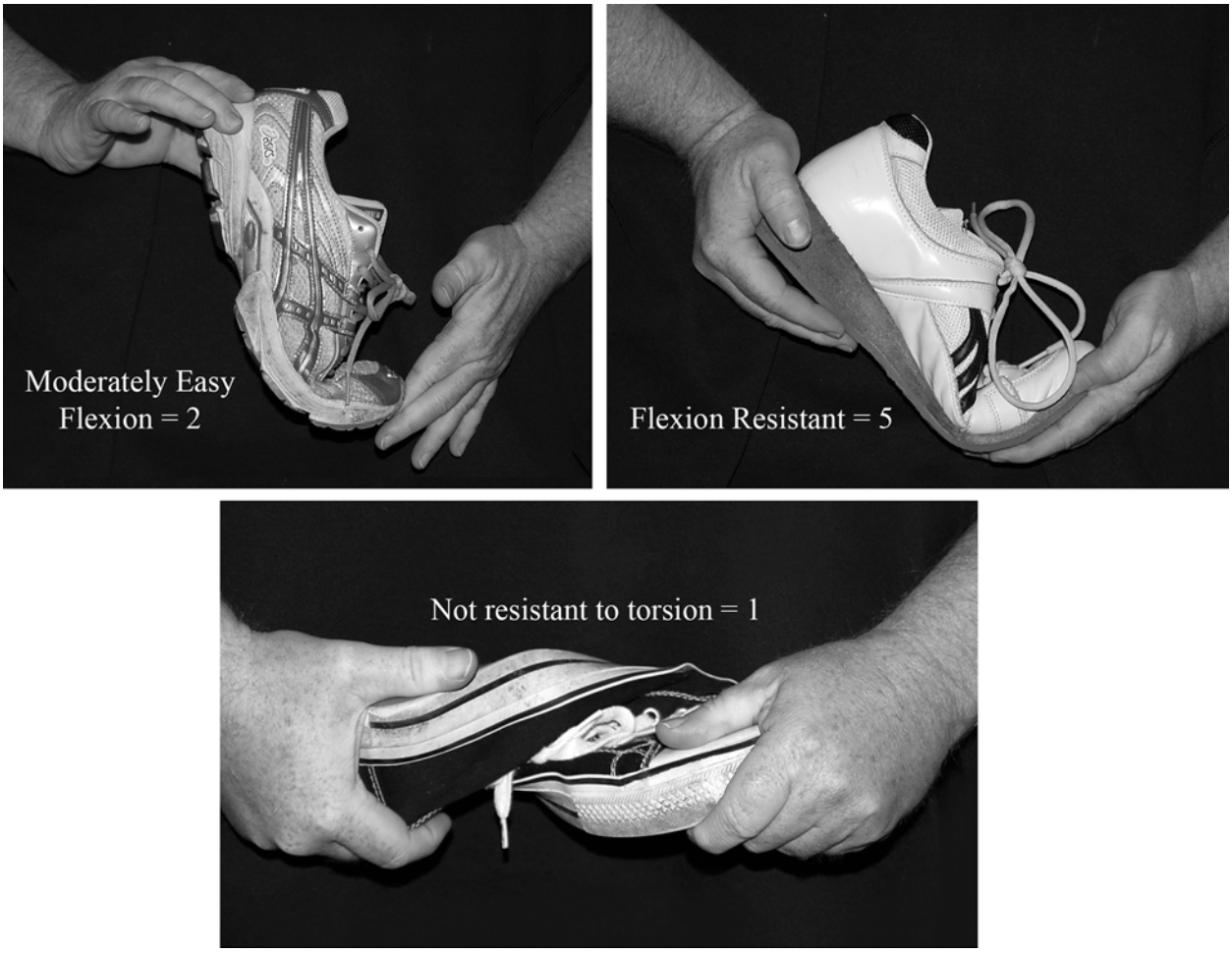

Figure 3:
Bending a shoe across the area of the ball of the foot with just a little effort earns a shoe a score of 2 (top left). If it requires a fair degree of concerted effort to bend the shoe, it warrants a 5 (top right). Being able to twist a shoe completely around its long axis earns it a 1 (bottom).

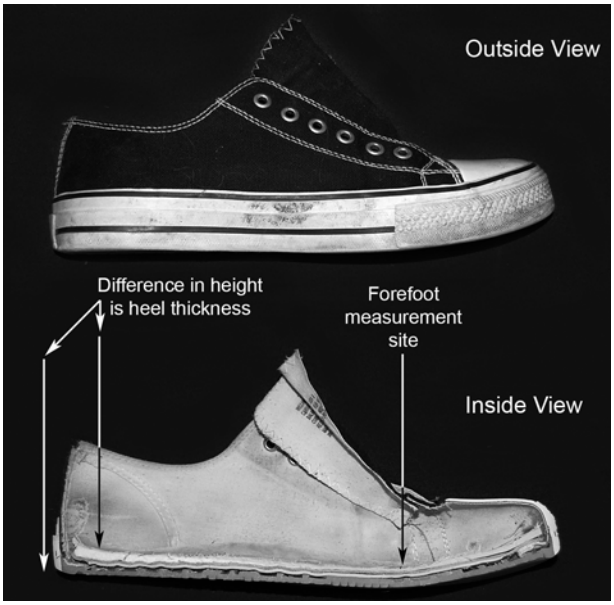

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Figure 4:
As you can see in the outside view, visually determining how thick a shoe sole is at various points can be difficult.

To obtain a more precise measurement, place one ruler on the inside the shoe at the furthest point to the rear of the heel and one ruler just on the outside of the heel (as indicated in "Inside View"). The differential is the height of the sole at the heel.

Do the same measurement as far forward in the shoe as possible. It is interesting to note that a shoe sole we consider to be very simple in construction and minimally cushioned is actually composed of five layers of compressible material.

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About the Author

Dr. Lon Kilgore

Professor Lon Kilgore has been teaching fitness physiology and exercise anatomy in undergraduate pre-physical-therapy curriculums and graduate exercise-physiology programs for nearly two decades. He has developed a unique perspective and approach relative to the application of science to sport and exercise that he passes on to his students—or anyone else who will listen. He graduated from Lincoln University with a bachelor of science in biology, then earned a master's in kinesiology and a Ph.D. in anatomy and physiology from Kansas State University. He has competed in weightlifting to the national level since 1972 and coached his first athletes to national-championship event medals in 1974. He has also competed in and still competes in powerlifting, wrestling, rowing and golf. Thirty-nine years after he started training, he still sets lifetime PRs at least once each year. He has worked in the trenches as a coach, as a sports-science consultant with athletes from rank novices to professionals and the Olympic elite, and as a head university strength coach. His interest in developing better weightlifting coaches, strength coaches and fitness professionals has driven much of his academic and professional efforts. He spent a decade as a certifying instructor for USA Weightlifting and was a frequent lecturer and researcher at the U.S. Olympic Training Center in Colorado Springs. His authorship efforts include books, magazine columns and research-journal publications. His illustration efforts have similarly appeared in many books and journals, and online.

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