

# the **CrossFit** JOURNAL ARTICLES

## Strong Enough?

Mark Rippetoe

It's been a hard year here at Wichita Falls Athletic Club. We've lost a couple of very worthwhile folks since last summer, and another good friend of mine died recently. Cardell was 45 when he was diagnosed with an ascending aortic aneurism that possibly involved the aortic valve. He was prepared for a complicated, dangerous operation, but sepsis developed almost immediately after the surgery, and he died as a result of complications from the infection. The reason I mention this rather unhappy personal item is that it took him three and a half weeks to die. That's a long time in the ICU, and he lasted that long because he was very, very strong. Cardell completely ruptured his patellar tendon at work a couple of years ago, a devastating injury that could easily have left him crippled for life. But he was strong, and five months after the surgery he squatted 315 pounds for 5 reps to our standards here at the gym (i.e., with full range). Strong people are harder to kill than weak people, and more useful in general. While we're on the subject, our condolences go to the family and friends of Jesse Marunde, who will be missed as well.

Strength is the ability to produce force, and it is possibly the most important component in athletics. It is dependent on muscle mass, on the nerves that make the muscles fire, and on the will that fires the nerves. Power depends on it, as does balance, coordination, speed, quickness, and endurance. Athletes will risk censure and

suspension to get it; there are no steroids for improving "technique." And once they have it, they are much harder to beat: all other things being equal, the stronger athlete will always win.

Technical ability is the capacity to execute a movement efficiently—completing the movement while using the least possible energy. It is the ability to adhere very closely to an efficient motor pathway in a consistent manner. As such, it can also be defined as the ability to demonstrate the strength available to complete a given athletic task,

since in its absence even great strength cannot be displayed in that movement. In this sense, strength is dependent on technical ability, even though strength is the quantity we most often seek to measure: the shot is thrown for distance, the bar is lifted for the most weight, the ball is hit over the fence, the lineman tackles the fullback hard enough to stop him. These are more obvious

examples of strength display, but all sports worthy of the name depend on force production within the context of correct technical execution.

Yet there are a number of competitive sports with athletes and coaches who think strength is not a terribly critical component of performance. Sports like swimming, fencing, cycling, soccer, cricket, tennis, boxing, and hockey pay lip service at some minimal level to strength training, but it is not a major part of most athletes' preparation for competition in those sports, and barbells are not a

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significant component of what little strength work there is. Even rugby, with its reputation as a big man's sport, has no organized school of thought on how to incorporate strength training. There will be isolated examples of individual athletes who utilize strength training to a greater extent than their peers, of course, and these people will usually be dominant in their sport—in part because of the training, and in part because of the motivation level of an athlete who actively seeks to prepare for excellence outside the normal realm of training and outside the actual field of play.

The amazing thing is that the sport of weightlifting is one of these. There is a school of thought—in the United States especially—that holds that training for correct technique in the snatch and the clean and jerk is more important than training for strength. Now that I've brought it up, the guilty will deny it. But I know what is being done to train our country's weightlifters at the highest levels—lots of us know—and it's not what you would call strength training. Athletes who go for extended periods of time without being asked to do a PR back squat or press, or any kind of heavy deadlift at all, are not being trained for strength in the usual sense of the term. And if you are one of those folks who are prone to dismiss anyone not directly involved with the National Program as not entitled to an opinion, you might as well stop right here. My opinion can be evaluated independently of my credentials, and if you are capable of doing that, you have my permission to continue reading.

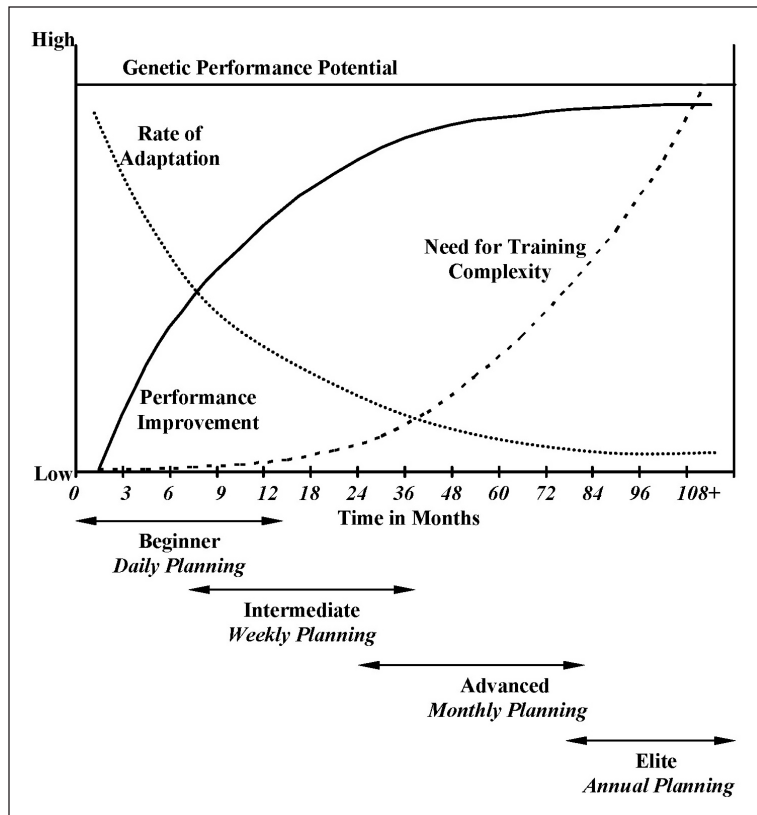
The case against a major role for strength training in technique-dependent sports is not always stated this way exactly. It may be claimed that time spent getting strong could be more productively spent improving technique; I think this is true only for athletes with bad technique. It also depends on the nature of the sport, as we'll see later. Or it may be claimed that technique contributes more to performance than strength, which might be true for golf and a few other games and activities but is not true for athletics. A golf club's business end is not very heavy, and the accuracy with which it is directed is much more critical than the small amount of force necessary to accelerate it around the body during the swing. (As an aside, Gary Player just announced that At Least One Pro Golfer That He Knows Of has taken steroids, and that random drug testing must begin immediately in the PGA to stave off the decay that now haunts Major League Baseball. This renders me astonished, puzzled, and amused. A large number of PGA professionals who win

lots of money are fat chain-smokers. There is even a local golfer here in Wichita Falls who shoots in the 70s and will damn sure take your money, despite the fact that he is 72, smokes, drinks more than I do, and has a prosthetic leg. What in the hell are these other guys wasting money on steroids for? I suspect that it has nothing to do with the actual game of golf.)

The case for strength training is a simple one. Both strength and technical ability are developable quantities that respond to a correctly designed program to make them improve. We refer to strength work as “training” and technique work as “practice.” Both produce improvement in roughly the same way: easy at first, harder as you get better, and after you're really good, more improvement becomes more and more difficult—then finally impossible—to obtain. It is said to approach a “limit,” a point past which further improvement cannot occur. This concept as it applies to strength is illustrated in Figure 1. A limit is the result of the fact that nothing can continue to improve infinitely or indefinitely. That's why new world records are not set daily in every sport. As a broad, probably overly-general rule, order in all systems increases only with the addition of energy, or “work”; entropy is the tendency of all systems toward disorder without the addition of work to combat all this heinous disorder, an observation derived from the second law of thermodynamics. To put it in another probably overly generalized way, there reaches a point at which the addition of an infinite amount of energy to a system results in an infinitely small increase in order. Order is what we mean when we say “improvement.” And that, my friends, is just how the Universe operates.

The graphic representation of the approach to a limit is described as an “asymptote,” a term from mathematics that describes the shape of the possible improvement curve as it approaches its limit. The limit of the ability to improve strength is ultimately controlled by an individual's genetics, as has been widely recognized. The closeness to which that limit is approached is determined by the ability to train in the most productive possible way, itself limited by time, resources, and motivation. Technical ability is limited as well, by the capacity to express mechanical efficiency. This ability is also controlled by the genetics governing neuromuscular efficiency, intelligence, sensory acuity, balance, and coordination; the closeness to which this limit is approached is a function of practice—its quality and quantity. In reality, these asymptotic curves get pretty wavy as they approach their limits, the result

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The generalized relationship between performance improvement and training complexity relative to time. Note that the rate of adaptation to training slows over a training career.

of injuries, forced layoffs, lapses in motivation, and all the other things that interrupt progress and keep the names of most great natural athletes from becoming household words. But if you pull back far enough to see the bigger picture, the curve approaches the limit smoothly, and then falls away as the career winds down.

All this should be fairly obvious, so the real question is this: What is the relationship between strength and its ability to be expressed through correct technique? Strength and technical ability are interdependent quantities. One does not exist without the other being present at some level. But it has been my experience as a coach that technique develops much faster than strength. Within six months of learning the snatch, any novice who has the potential to be a competitive weightlifter can do an essentially perfect snatch with, say, 30 kg, and two years later that same lifter will be snatching 100 kg with just about the same technique. The quantity that has continued to improve is strength, not technical ability. An argument can be

made that technical ability must keep pace with strength, but technical ability on the snatch must remain at a level that allows the snatch to actually be performed, or you're not snatching, you're dropping the bar from overhead with a wide grip. As you improve your snatch (i.e., move greater weight), you are getting stronger with the same technical ability, so which quantity is actually improving? Both maybe, but strength certainly. In fact, the improvement in a weightlifter's snatch over a career looks quite similar to that of a powerlifter's squat, bench, or deadlift—movements that require only a small percentage of the technical skill required to perform a snatch.

A common argument is that some lifters are able to convert a very high percentage of their strength into the technical execution of the snatch and the clean and jerk, and that since this is the case, strength per se is not the limiting quantity. It seems to me that since strength and technical ability are interdependent quantities, there is a ratio between any individual's ability to produce a correct technical effort and a given level of strength. There are exceptionally "efficient" lifters, like Yuri

Zakharevich, Anatoli Pisarenko, and Jeff Michaels, who can do a clean and jerk with a weight that is just short of their best front squat. The reason we remember who they are is because they are the exceptions. Most lifters need a margin of strength over and above their ability to execute technically so that the minute imperfections that are always present in even a nearly perfect snatch do not significantly affect the lifter's ability to finish the lift. No snatch is 100% mechanically perfect, and if sufficient strength is available it is possible to save what would otherwise be a miss by wrestling it back or forward or up as needed; in this way, enough strength makes perfect technique slightly less critical.

But these exceptional lifters still demonstrate the phenomenon of the ratio between a lifter's strength and his ability to demonstrate that strength in a technically demanding movement. This ratio may even change over time, as the athlete ages; a close ratio may be a feature of younger lifters more commonly, and most of the ones

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I know of in this situation are in fact young. It also varies with the conditions under which each type of max effort—squatting strength and snatch technique—is measured. If, for reasons of training schedule, strength is at peak and technical practice is not, the ratio will be different than it would be the week before a meet. But some lifters will always be more efficient than others, and that is a perfectly reasonable thing to expect. And since this ratio exists, the more easily improved quantity in the equation will drive up the value of the sum if it is increased. Those lifters who are able to clean a very high percentage of their deadlift are either very technically efficient, or not very strong, depending on your prejudice. Most lifters clean a lower—rather than higher—percentage of their deadlift, but either way, the ratio between strength and technical ability for an individual lifter is an identifiable quantity. And if the strength variable is increased and technical ability stays the same, the ability to display strength through technical ability increases. Do the math.

My point here is that after a certain level of technical improvement, which occurs relatively early in a lifter's training, the quantity that will always remain the most improvable is strength. This is because technical ability is primarily a neurological and neuromuscular phenomenon. It is developed through basic instruction, repetition, correction, mental modeling and imaging, more repetition and correction, and then a diminishing amount of correction as the movement gets embedded and the "feel" for correct performance becomes developed. This process, for a person actually capable of learning the movement (unfortunately, there do exist motor morons) takes a few weeks to a few months. The development of strength, on the other hand, takes years. The processes involved in building strength involve muscle, bone, connective tissue, and endocrine systems as well as the neuromuscular system, and the remodeling of these tissues takes time. Strength acquisition requires a much more profound change in physiology than that which accompanies the learning of a movement pattern, and the processes that bring about this change do their work over months and years, not just weeks.

And if technique has been worried about at the expense of strength, as it very well might have been for many American weightlifters, the potential for improvement in overall performance lies in strength improvement. Shane Hamman told me recently that he was quite sure that the lifters he had competed against at the international level were much stronger than he was. He cited the example

of Hossein Reza Zadeh, the Iranian superheavyweight whom he saw do a 230-kg (506-pound) power clean at the 2004 Olympics "without bending his knees" at the catch. Shane said he never saw him squat anything much heavier than 280 kg (616 pounds) for a triple in the warm-up room, but a guy who is about to compete in the Olympics might not be inclined to do a PR back squat in the warm-up room at the meet just to show everybody. The 230 power clean was all Shane needed to see. He had the same impression of the other lifters in the "A" session, where the lifters expected to place high in the meet are grouped. Shane's opinion about strength is not to be ignored: he has squatted over 1000 pounds in suit and wraps, and I personally witnessed him squat 804 in a pair of lifting shoes, shorts, and a t-shirt—no belt or knee wraps—and handle the weight explosively, immediately followed by five standing back flips.

I know athletes who have been at the Olympic Training Center in the weightlifting program for various periods of time and never been asked for a PR back squat, front squat, or, god forbid, a deadlift the entire time they were there. This is a common feature of weightlifting training in this country, where the only lifts that are emphasized or coached for technique are the snatch and the clean and jerk. Some weightlifting coaches may tell you that they train the squat hard, but this critical exercise is approached with the "Just put the bar on your back and squat it" coaching method, the same one that has worked so brilliantly for high school football players for decades—and to similar effect. It is as if they think that coaching the squat, the press, and the deadlift for technical correctness and efficiency is beneath their dignity, that technique is only important in the snatch and the clean and jerk. Some of their lifters even have perfect form on the two lifts, in the B session. The critical thing is that quite often the A-session lifters have less than perfect snatch and C&J form, but are strong enough that they can get away with it.

The lifters who regularly stomp us to death at the World Championships are probably not coached for strength either. Their programs have the luxury of high enough participation and a large enough pool of very strong lifters to choose from that strength coaching need not be a primary concern. China has 1.3 million registered lifters—they can find eight men and seven women strong enough to beat us without a lot of trouble. But not devoting a bunch of time to making their national team stronger doesn't mean that strength is not important to

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them. If you're on their team, you are by definition very damn strong. And if you can't stay strong—or, more likely, alive—on their program, they can find someone else who can. Big, efficient programs like those run by most European, Asian, and some African countries advance enough athletes to the higher levels that the national team has plenty of strength talent to choose from, and the program itself does not have to focus on strength. It is just like the NFL, and for exactly the same reason—a huge talent pool and lots of feeder programs. USA Weightlifting, with its 3,000 members, is not. My point is that if your weightlifting team is good enough that you don't have to worry about making them stronger, that's wonderful, but if it isn't, you'd better do something about it. We don't seem to be.

And again, if strength is not important, why do we worry about steroids? An entire enforcement bureaucracy—USADA/WADA—now exists because of athletes' persistent use of drugs that are primarily taken to make them stronger, by whatever mechanism. Steroids do not make your technique better; they just make you able to handle heavier weights with your same technique. Bodybuilders don't use them to make their Double Biceps pose more fluid and precise. Cyclists don't use them to make their pedal stroke more efficient. Professional wrestlers don't take them to improve their Sleeper Hold. Baseball players already know how to hit the ball; steroids just help them hit it farther, not more precisely. Whatever the reason for taking them—improved recovery, neuromuscular efficiency, weight gain and leverage improvement, “tightness,” aggression, and so on—they work because, ultimately, they make you stronger. And, clearly, stronger is important enough to these athletes to risk a career for.

Athletes and coaches in other sports share this misunderstanding. Judo is a martial art with strength and technique components that are not quite analogous to Olympic weightlifting. It takes longer to gain technical proficiency in any martial art because of the much more extensive catalog of movements involved and the complex nature of their application. A weightlifting meet always involves three snatch attempts followed by three clean and jerk attempts; a judo match consists of the

extemporaneous application of the appropriate number of many thousands of technique permutations, depending on conditions that change constantly over the length of the point. Technical ability in judo is arguably much more important and much harder to develop than it is in weightlifting.

Yet great strength trumps technical ability in judo, provided that the players are of similar bodyweight. The sport places a high premium on the use of leverage to overcome an opponent's strength, but at some point strength cannot be overcome by anyone save the most

highly skilled player. Great strength allows imperfect technique to be forgiven. My friend Gant Grimes, an experienced and capable judoka, was once destroyed by an opponent named Brad Sanchez, a guy who had beaten a national champion despite having trained for only a few months. Sanchez was a 500-pound bencher, strong everywhere else too, and

his strength rendered an opponent's superior technical ability irrelevant. Gant was chokeslammed by this guy, and he says there was literally nothing he could do about it. [See “Strength on the Mat”, below.]

Here is where the difference in the technical-ability learning curves for the two sports is critical; most weightlifters are experts at technique in a year, maybe two, whereas in a sport like judo, important improvements in technical ability can continue for decades. Depending on how much mat time you have accumulated—and how many months or years it takes to do so—it might behoove a judo player to spend at least a decent amount of time under the bar. And despite this fact, the vast majority of judo coaches resist the idea of adding barbell strength training to preparation for the sport.

As with most sports coaches who lack specific training or experience with barbells, their reluctance is understandable, the result of a perfectly reasonable desire to avoid coaching things they don't know about. Now, this has never stopped a high school football coach from telling his athletes to look up at the ceiling when they do their half-squats, but it is conceivable that a conscientious sensei who has never lifted weights might be reluctant to put a bar and plates in the dojo. What

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would not be understandable is that same sense advising against learning barbells and spending 45 minutes twice a week doing them.

It is also understandable that endurance sports coaches might not have an appreciation of the contribution that strength training can make to training for long-slow-distance sports. The easiest way to understand how this works is to look at the example of cycling, where each pedal stroke represents the use of a percentage of absolute strength. If your absolute strength goes up (as it necessarily will when I take your narrow little cyclist ass into the gym and double your squat strength in six weeks), then the percentage of your absolute strength used on each pedal stroke at the same speed goes down (by about half). Or, the force you can apply to each stroke over your three-hour ride can go up. Either way, strength has contributed to pedaling endurance. And if you get your pull-up strength up too, you can more efficiently control the frame while you pedal: your pull on the bars decreases uncontrolled frame “rocking” and maximizes force directed to the pedals. That should be enough evidence for cycling coaches to appreciate the contribution of strength training to the sport, but somehow I don’t think they will. Cycling coaches are among the most resistant human beings on earth when it comes to ideas involving things other than bicycles.

Strength is quite simply the quality that separates winners from losers. “All other things being equal,” so the saying goes, “the stronger athlete will win every time.” Old sayings are sometimes foolish, but not this particular one. Technical ability allows strength to be demonstrated more efficiently; however, having better technique does not make one stronger. Both are necessary, and both should be coached, trained for, and appreciated with equal enthusiasm. But even if we remove a particular sport from the discussion and substitute “survival” as the activity we’re training for, I’d take strength over technique every time. Cardell would agree. The process that has yielded us and every other living thing on this planet has an appreciation of strength, and we should too.



Mark Rippetoe is the owner of [Wichita Falls Athletic Club/CrossFit Wichita Falls](#). He has 28 years experience in the fitness industry and 10 years as a competitive powerlifter. He has been certified as an NSCA Certified Strength and Conditioning Specialist since 1985 and is a USA Weightlifting Level III Coach and Senior Coach, as well as a USA Track and Field Level I Coach. He is co-author, with Lon Kilgore, of the books [Starting Strength: Basic Barbell Training](#) and [Practical Programming for Strength Training](#), and has published a collection of his essays titled *Strong Enough?*