

# Starting Strength

## Strength & Barbells: The Foundations of Fitness

by

**Michael Wolf**

If I had a dollar for every time a client or athlete has asked me why they have to do heavy squats and can't they just do lunges instead, or the same question phrased slightly differently and with a different alternative exercise, I'd probably have enough money to equip the black iron gym I've been trying to open. If I added to that the number of times I've seen similar questions asked in the forums, I could probably even afford the rent.

The issue of force production and its importance in life and athletics is dealt with at length in SS:BBT3, PPST2, and the SS Seminar. So why this article? Well, it seems that many people are still confused about it, despite the information available in those resources. For some, this may be due to laziness; actually read the book and attend the seminar, and it will all become clear. For others, it may be a function of organization: the info is there to find, but scattered throughout the sources. When you quickly learn so much information on a subject with which you were previously only passingly acquainted, it can be difficult to assimilate all that new knowledge into a coherent package that you can pull out of your brain for later use. You're convinced of the efficacy of strength and barbell training, but can't quite organize a cogent response to the question "Why?"

What I'll try to do here is give you the "Elevator Pitch," to borrow the over-used phrase from the marketing industry, on force production and barbell training. I'll attempt to answer the following two questions directly, in a briefer article form:

- 1) Why should training focus on strength/increasing force production?**
- 2) Why is using barbells is the best way to accomplish this training goal?**

Reading this article doesn't replace any of the valuable "how" of the books or seminar. Certainly not the "why." But it does give a shorter, digestible summary of the latter that you can use to explain to yourself, or anyone who asks, why this training is so useful and important. Nothing here is original, and Rip always explains this stuff much more clearly than I can. I've simply attempted to put the material in one place, to answer those two questions.

Before going any further, let's get some basic information out of the way: strength is the ability to produce force against an external resistance, and force is that which causes movement. Keep those definitions in mind throughout the article.

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Now, to get right to the heart of the issue: Why aren't dumbbell lunges and presses, kettlebell swings, cleans, and presses, and the TRX all you need? Why do we need to train to increase force production anyway (for those who aren't powerlifters)?

The answer is simple. So deceptively simple that much of today's fitness industry is comprised of unnecessarily fancy and complicated methods that avoid it, because simple and heavy doesn't sell as well as complicated and light. Strength is the most general and useful fitness adaptation, the one adaptation that most affects all others.

When you do any form of resistance training, be it bodyweight, TRX, barbell, or pink dumbbell bicep curls on the Bosu, what you're doing is making your muscles produce force. You're using some percentage of your strength as your muscles contract to produce enough force to lift the weight, move your bodyweight, swing the kettlebell, etc.

Our muscles are simple engines. They can't get confused, or decide in what direction to cause movement. They contract when the brain tells them to, and cause the bones to which they're attached to move. In the final analysis, any form of resistance training is essentially force-production training, and the only question is, are you training your muscles to produce more force, or are you making sub-optimal use of your time?

Jim Cawley's 10 aspects of fitness is probably the most useful definition of fitness available today. Using his definition, the reason to train for strength becomes obvious.

**1. Cardiovascular/Respiratory Endurance (CRE)** – Although this aspect is the one least effected by gains in max force production, strength training using heavy sets of 5 reps does tax the heart consistently and heavily enough to elicit a small increase in CRE.

**2. Stamina** – Local muscular endurance is increased mightily by increasing maximal force production. As Rip writes in *Strong Enough*, and explains at every seminar: every pedal stroke in a 100-mile bike race is a repetitive sub-maximal effort that requires a very small percentage of max force production for Bob the cyclist, who can squat 100 pounds. Just to throw out a figure, we'll say each stroke represents 0.1/100 of Bob's force production capacity. If we take 6 weeks and double Bob's squat strength to 200 pounds, now each pedal stroke at the same speed represents only half the previous percentage of Bob's max effort – 0.1/200, which is 0.05/100 – so he can either go further at the same speed before fatigue, or go faster (by pedaling harder/producing more force) for the same distance.

**3. Strength** – It seems obvious to this author that increasing your strength will increase your strength. But perhaps I jump to too many conclusions. I'm reckless that way.

**4. Flexibility** – While increasing force production by taking a magic force production pill may not increase flexibility, we only need deal with realistic scenarios. Increasing strength by utilizing a full range of motion barbell program will increase flexibility if deficient, and maintain flexibility in those who already possess it in sufficient quantities. In some cases of extreme tightness, extra stretching may be necessary at first, but once the ability to assume the key positions in the barbell training program has been attained, simply performing the movements regularly is enough to maintain adequate flexibility in most people.

**5. Power** – Power is defined as (force x distance) / time. In layman's terms: strength displayed quickly, or strength...RIGHT NOW! While the ability to recruit the strength you have for immediate use is largely genetic, the strength side of the equation can be trained for and increased significantly. And using some basic math, it's obvious that if you increase the 'force' side of that equation, you increase

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the power. *Even if you do not improve the 'time' side of the equation.* As Rip says, “A man with a 500lb deadlift will always be able to clean more than a man with a 200lb deadlift.”

**6. Speed** – Linear running speed is most directly a function of how much force you can put into the ground during your stride. While this seems obvious, it was previously thought that the amount of time between one stride and the next might have a large impact on speed. In a study appearing in *The Journal of Applied Physiology* in 2000, however, Dr. Peter Weyand determined that all humans take almost exactly the same amount of time between one stride and the next, regardless of their running speed. The major determining factor in speed is not time between strides, but how much force is put into the ground during foot contact. Average runners put significantly less force into the ground than Olympic level sprinters.

It is undoubtedly true that minor variations in technique and efficiency, and factors other than just force production, can contribute to the difference between a 9.63 gold medal and a 9.79 bronze. However, it is clear that for athletes who lack a strength training background, an increase in force production has a directly positive impact on running speed.

Also of interest is the observation of the effect that training the squat and deadlift in previously untrained populations (especially kids) has on speed. We've observed high school soccer players, previously untrained in the weight room, take a full second off their 40-yard times in only two weeks, after learning the squat and deadlift. While their force production increased, six squat workouts and three deadlift workouts doesn't seem to be enough of an increase to account for such a rapid improvement in 40 time on its own. Our theory is that learning to keep their backs rigid was a significant contributor to the faster speed they displayed in such a short time. When running, as in performing the lifts, a rigid back transmits force efficiently through the segment – in this case, from each foot to the other through the back as it anchors each hip extension. This allows more of the force produced by the 'engines' of the hips and legs to propel the entire body forward. A loose back not held rigidly in extension will absorb some of the force produced by the hips and legs as it relaxes into some degree of flexion during each stride. So instead of all that extension force contributing to faster propulsion down the track, a percentage gets soaked up by the back and doesn't lead to increased speed.

The untrained general population's ability to hold their back in rigid extension is astonishingly poor. We can point the finger of blame for this sad truth in many directions: the invention of the chair and couch; the shift from farming and blue collar labor to white collar; the invention of air conditioning; the Communists. Wherever the fault may lie, the fact is that many, if not most, untrained people don't know how to hold their backs in rigid lumbar and thoracic extension while in any position other than standing, and a sizable percentage not even then.

The good news is that control of the spinal erectors is easily learned, even for most motor morons. There's a group of men at every seminar who don't have conscious control of their erectors despite having some lifting experience. Inside of a few minutes, we are able to teach them to control their back muscles and they then apply this newfound control to the lifts.

Squatting and deadlifting require this spinal erector control to be applied under load and under increasingly difficult conditions. This aspect of lifting carries over well to running and sprinting, where a rigidly held back is a key transmitter of the force produced by the legs.

**7. Coordination** – The better your ability to recruit motor units to maximal force production for any given movement, the more easily you can coordinate submaximal movements. See below in #10 Accuracy for more details.

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**8. Agility** – Reducing transition time from one movement pattern to another is improved by your ability to maximally produce force. You can more quickly produce enough force to stop one movement pattern (and stop your body's movement in that direction, if applicable), overcome inertia to begin moving again, and then move your body (and any implement you may be holding) in the desired direction to begin another, new movement pattern.

**9. Balance** – Keeping your center of mass (COM) over your base of support (BOS) is partially a function of your ability to produce the force necessary to do so. To illustrate how, Rip often uses the example of lying on your back. This is the easiest position in which to keep your balance; you can produce virtually no force and manage to successfully lie on your back. To sit, you need a slightly greater amount of force; there's some tension in your legs, and some of the muscles of the trunk and back get involved to keep you sitting up. Continue on to standing, walking, running, and finally squatting. Each progressive step is a slightly more challenging one in terms of keeping balance – keeping your COM over your BOS – and each one requires more force production than the one before it.

A note here about balance: it's interesting to consider this from the point of view of sports practice as opposed to strength training for sports. Not too long ago, it was thought (and still is, by many) that lifting weights while balancing on an unstable surface would increase balance better than lifting heavier weights in a conventional manner. Studies have shown this to be incorrect, so most serious practitioners in the strength and conditioning world have now abandoned the stability ball to the realm of commercial gym personal trainers who are entertaining their clients more than training them, and getting their info from Tracy Anderson or Jillian Michaels DVDs.

However, a simple analysis would have led to the same conclusion without waiting for a study to show it. Balancing on a wobble board, Bosu, or stability ball is a *skill*. It's improved through practice – stand on a ball every workout for a couple weeks, and you become adept at standing on a ball, just like sports practice. It has nothing to do with *strength training* for sports. It cannot, except in the case of a completely untrained person, provide enough overload to increase force production, and thus improve the person's general ability to keep their COM over their BOS in all circumstances. It just makes them better at balancing on the ball.

Similarly, we are not suggesting that training up to a 500-pound squat will automatically make you a master tightrope walker or expert snowboarder. Many high level balance-dependent activities have large skill components, which need to be practiced and honed to achieve competence and then mastery. The ability to produce more force will not, in and of itself, improve your skills at these activities. However, it will allow you to better express the skills you have if you are not already strong.

Most healthy untrained people can produce enough force to perform basic activities of daily living without needing assistance. One of the most important things we can do, however, is give an older person her quality of life back. Training force production can allow her to get up off her chair, or use the bathroom, unassisted. It can allow her to walk with enough strength to maintain her balance, not fall over, and avoid the broken hips that so often mean the end of an independent existence for seniors.

**10. Accuracy** – Once again, the ability to control movement in a specific direction is greatly enhanced by the *maximum* amount of movement you can create in that direction. For instance, using all your genetically endowed might, you can just barely muster the strength to throw a 3-pound ball at a target 30 feet away. We force you to abandon your Insanity DVDs for the barbell, and make you stronger over a month or two, so you can now throw a 6-pound ball at the target thirty feet away. What happened to your ability to throw the 3-pound ball at the same 30-foot target? It will now be more accurate. In

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a manner similar to stamina, because that effort requires a lower percentage of your maximum than it did before, you can exert more finely tuned motor control over it. Obviously the effect will vary depending on your skill in throwing a ball. But keeping skill constant, simply increasing strength will produce greater accuracy.

With all that in mind, we've seen that force production is not only the engine that drives movement, but also the engine that drives fitness. Other than Cardiovascular/Respiratory Endurance, it has a profoundly positive impact on every other aspect of fitness. However, strength is necessarily gained slowly, whereas CRE can be increased quickly. This is because CRE gains are mostly chemical/metabolic alterations, whereas gaining strength involves architectural changes in the body. This is a long, slow process that accumulates over a lifetime.

This idea was [described succinctly in the forums](#) by Dr. Jonathon Sullivan, aka Sullydog, while discussing the issue of how many calories are burned by doing a heavy set of five squats:

Obtaining precise values for energy utilization during anaerobic and mixed aerobic-anaerobic exercise is notoriously difficult. This isn't running or Pilates, where the consumption of oxygen correlates nicely with the amount of energy consumed, and the energy expenditure after exercise stops begins to approach baseline again...

...you need to incorporate into your thinking the tremendous caloric requirements of recovery, including architectural remodeling at the tissue level. If you could find a way to accurately measure it, you'd find that a heavy set of squats consumes calories at an increased rate for **days**, although the rate would be variable depending on the individual...Moreover, a lot of consumed energy would be used not for production or fat-storage, but for repair, growth, and glycogen deposition.

It follows that since 1.) strength significantly improves nine of the ten aspects of fitness, and 2.) the tenth can be improved rather quickly, and 3.) whereas strength increases require architectural changes that happen slowly, therefore strength should be the primary aspect trained for, with any other necessary aspects (such as CRE) focused on temporarily when necessary. Your elevator pitch for increasing strength (maximum force production), ladies and gentlemen. Are you buying?

The case for focusing on strength brings us to our next topic: Why is using a barbell the best way to train for increased strength? The issue that arises is the observation that people have gotten strong without using barbells. Most people know someone – a friend, an uncle, their roommate's brother – who has gotten strong and put on lots of muscle using only dumbbells or even just bodyweight training. So why do we need barbells?

The answer isn't that you can't improve your strength any other way. Of course you can. But every other way has limitations that simply don't exist with a barbell. Barbells allow:

- 1. Infinitely scalable loads:** you can increase the overall load by as little as 1lb or less with the right equipment – microplates or some washers.
- 2. The maximum load to be lifted:** if you are planning to increase maximum force production, you'd better use the tool that allows the most weight to be lifted.
- 3. Training using only a small number of movements:** with fewer skills to learn and movements that stress the entire system, barbell training causes that entire system to adapt and get stronger. Not just muscle, but tendon, bone, ligament, heart, vessels, lungs, skin, *everything*.

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**4. Movements that have clearly defined and reproducible ROMs**, to ensure objectively that progress is being made.

To elaborate a bit on some of these advantages: increasing maximum force production for some movements can, after a relatively early point, only be done with a barbell. Let's take the squat. Sure, you can learn the Goblet Squat and become stronger than you previously were by doing it. But how long until the weight you can hold in the Goblet position is no longer enough to challenge the force production capacity of your legs? Two weeks or less, for most men. After that, you're going to be increasing primarily your stamina (local muscular endurance), which only improves that one of Cawley's ten aspects of fitness.

Even the dumbbell bench press, a potentially useful assistance exercise for Intermediate trainees, has limitations. You need to get the dumbbells into position, which at heavy weights is more challenging than simply unracking the barbell off the bench press. More importantly, the dumbbell bench press is not scalable in appropriately small increments; you typically have to go up 5lbs per dumbbell, which can be too large a jump to make at limit or near-limit weights. And of course it doesn't have a definitive, objective, and easily visible end range of motion like the bench press.

Finally, because the barbell allows the most weight to be lifted and puts the entire system under load, it also trains the "anti" movements inherent in the function of many of the muscles. The primary function of the muscles of the trunk, for instance, is isometric – they prevent movement of the spine. Barbells allow them to be trained in exactly this way, keeping the trunk column rigid during the lift to protect the spine. Ah, but smart guy that you are, you point out that dumbbells and kettlebells can do exactly the same. Well yes, they can, but not at nearly the levels of overload that can be achieved using a barbell. The rising popularity of the Pallof Press and its many variations is a sign that the industry is beginning to understand the function of the abdominal and other trunk muscles, and that crunches and situps are not necessarily the best way to work them. But heavy squats, deadlifts, and presses render unnecessary the need to do specific "anti-rotation" or "anti-flexion" movements with bands or cables.

No other strength tool has these four advantages, making the barbell the tool of choice for strength training. Even if it is possible to get stronger using other methods, the choice for a serious trainee between using something that works and using something that works better is no choice at all.

We've now seen how literally every aspect of fitness is enhanced by increasing your maximal force production – increasing your strength. While some activities and sports require a higher amount of absolute strength than others, there's no doubt that every single one benefits from increased strength. And we've also established that for increased strength, there's no tool as useful as the barbell.

The squat rack in your local gym is probably unoccupied right this very moment. What are you waiting for?

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