

Starting Strength

Barbells vs Machines vs Everything Else

by

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Barbell training is the best way to train for strength. Bar none. Nothing else even comes close to the effectiveness of barbell squats, presses, deadlifts, and the Olympic lifts for the development of strength, power, and muscular size. The reason barbells are so very valuable is that they are the most ergonomically-friendly load handling tool in existence – they allow very heavy weights to be gripped in the hands and moved directly over the center of the foot. Their extremely adjustable nature allows small increases in stress to be applied to the whole body over the full range of motion of all the major leverage systems of the body increases that accumulate into amazing gains in size and strength for many uninterrupted years of progress. You should be using them.

First, some basic background material. The biological basis of all exercise is *stress*: stress is a physical stimulus that causes a change in the body's current state of equilibrium. Stress can be physical exercise, an unaccustomed lack of physical exercise, an infectious disease, or a very long, very late party. *Recovery* from that stress is the body's way of preparing itself for a potential future exposure to the same stress. The process of stress and recovery results in *adaptation*. Adaptation to exercise increases strength or endurance, adaptation to an unaccustomed lack of exercise decreases strength or endurance, adaptation to the party prepares the liver for the next one, and adaptation to infectious disease is immunity.

Training is the process of creating the desired adaptation for a specific physical task. Strength – the ability to produce force against an external resistance in the environment – is the basis of your interaction with that environment, since force is expressed whenever you touch anything with your hands and feet. Even for endurance activities, increased strength makes repetitive submaximal repetitions even more submaximal. *Strength training* is specifically designed physical activity that produces an increase in strength as the adaptation.

A long time ago, gyms were equipped with barbells. And that was pretty much what you went to a gym to use – a steel bar and iron plates that were added to increase the weight. If you used them while standing with both feet on the ground, a natural position for a bipedal creature such as yourself, there were a limited number of exercises that you could do. You could put the bar on your back or shoulders, squat down and stand back up. You could put it in your hands and press it up overhead. Or you could put it on the floor and pick it up. But these simple approaches worked very well, because they utilized the normal functions of all the joints and muscles in the body.

Barbells vs Machines vs Everything Else

Standing barbell training can be summarized very succinctly: moving your body's mass and a weighted barbell in a vertical line over your center of balance – the middle of the feet. Keeping the weight close to the body is the normal way to handle any load you work with. You already do it this way without thinking about it. For instance, pay attention the next time you pick up something heavy from the floor. You stood as close to it as you could before you lifted it, because your experience has taught you that the closer the load is to your feet, the easier it is to lift. Chances are that when you've gotten hurt handling a load, it happened when the weight was not close enough to your center of balance.

The increased use of various types of benches altered the basic nature of barbell training, and this enabled the bench press to replace the standing press as the basic upper-body exercise in the gym. Benches allow the center of balance to be moved to your back or your butt, and this is how the bench press or any seated barbell exercise works. But the default position in barbell training *should be* standing with the load, both feet evenly spaced under the weight.

The barbell offers a way to load the body's normal movement patterns with progressively heavier weights, a process that essentially *forces* the body to get stronger whether it wants to or not. After all, if you start with an empty 45-pound barbell laying on the floor and add just 5 pounds to it every week, in 6 months you're deadlifting 175 pounds. In a year, you're up to 305. And almost nobody starts with only 45 pounds – your mom is stronger than that from having picked up your ungrateful ass off the floor all those years.

One of the most important features of barbell training is that *it's possible to fall down* while you're standing there with the loaded bar. Learning to move the barbell through the body's normal range of motion *without falling down* means that you're producing force and balancing at the same time. The use of your ankles, knees, hips, spine, shoulders, elbows, wrists, and fingers, and all the muscles that move them – all working together, under an increasingly heavy load – while you intentionally fail to fall down, means that all your joints and all your muscles are operating the way your anatomy is designed to operate: getting stronger while balancing on your feet.

Barbell training is simple, logical, effective, inexpensive, and most important, *proven*. It has worked in its current form for decades, for millions of people. It has formed the successful strength training foundation for athletes since the early 20th century.

But wait...

An alternative to this perfectly logical approach to getting stronger was developed from some ends and pieces that were floating around in gyms owned by guys who could weld: exercise machines that worked a few isolated muscles at a time. Simple versions had been in use for decades, and old photos of leg extension and leg curl machines can be found in magazines from the 50s and 60s.

In the middle 1970s, Arthur Jones began marketing his line of Nautilus machines to health clubs, sports teams, high schools, colleges and universities, and everybody else on the planet. Within a couple of years, he'd sold about \$300 quadrillion dollars worth of the beautifully welded, beautifully designed electric-blue machines, 12 pieces at a time. Nautilus revolutionized the health club industry, establishing the concept of the modern health club, like the one you're probably a member of, with sales offices in the front, a huge roomful of shiny machines in the back, and several just-above-minimum wage employees roaming the floor.

The Nautilus circuit consisted of 12 different exercises, each performed one after another in a specific order, one set to failure. It destroyed you. Thrashed you. Fried/barbequed/blasted/obliterated/

Barbells vs Machines vs Everything Else

murdered you. The Nautilus circuit humbled even the most arrogant former high-school athlete, because working a small group of muscles at the edge of its capacity is difficult and uncomfortable. However, it did not make anybody stronger on anything besides Nautilus machines, where it worked for about 6 weeks. For someone who has not been training, anything works for about 6 weeks, because for novices to training who are unadapted to any physical work, *anything will drive an adaptation and make you stronger*. For about 6 weeks.

But from a business standpoint, Nautilus was easy to understand, easy to administer, and easy to coach, because the machines only moved one way. That's why the Nautilus-club model was so successful: it was based on sales, not training or exercise. The club could now hire anybody that looked the part to work the floor in a machine-based club, because it took about 35 minutes to learn how to "coach" all the exercises. Since there are no variations, there was nothing to learn except how to adjust the seat height. Then, sales staff development can be where you spend your money. From a management perspective, this makes perfect sense.

The machine-based club model also gave birth to a new approach in the rapidly expanding Physical Education market at the university level. Since PE graduates had to work somewhere, and health clubs were springing up all over everywhere, the machine-based approach to exercise was quietly embraced by the academic community too. The growth of an entire body of peer-reviewed journal-published literature has been largely based on the use of exercise machines as the instruments with which we investigate the human body's response to physical stress.

So, an interesting situation has been created over the past couple of decades, in that more people than ever in history are actively performing regular exercise, but the overwhelming majority are doing it ineffectively. Machine-based exercise does not work very well, and it's important to understand why.

Sometimes the obvious is wrong.

If it seems counter-intuitive that something physically hard enough to make you puke nevertheless lacks the capacity to make you much stronger, reflect for a moment upon the definition of strength – force produced against an external resistance. Strength is the most general physical adaptation, in that it has a positive effect on all other physical attributes. When one is "strong" one's *entire body* is strong, not just one's quadriceps, or biceps, or triceps.

Machines have never formed the basis of the competitive strength athlete's program, because they lack the barbell's capacity for long term progress: you cannot increase the weight on a leg extension for years, like you can a deadlift, because muscles do not normally work in isolation from all the other muscles in the area. They work as a system of motors that operate the levers of the whole skeleton, which moves the loads we encounter when we use our bodies every day. Machines use only one or two levers at a time, while the deadlift uses *all of them*. And all of them working together can move more weight than one or two of them in isolation.

Since the system working as a whole can move heavier loads, it can apply much more stress to the system than can one isolated muscle group at a time. Working an isolated muscle group to failure certainly has the capacity to produce physical discomfort, but since its ability to produce force is limited by the mass of the working muscle, so is its capacity to increase strength. Deadlifts, squats, and presses therefore have the capacity to stress more muscle mass and produce a greater strength adaptation than do isolation exercises.

Some machines, as discussed earlier, select a few muscles at a time that operate one or two joints. It's easy to see the problem with these: they don't work enough muscle mass to cause enough

Barbells vs Machines vs Everything Else

overall stress to make anything change. You can work them hard enough to feel like hell while you're on them, but they just don't make you stronger for anything *except that exercise*, because there is more to useful strength than the motion around one joint. I'm very sorry about this, but squats make you strong and leg extensions do not. Much time and energy has been expended in proving this over and over again.

Some machines use more muscles and joints, like the Hammer Strength football-market devices. Some, like the venerable Smith machine found in most modern clubs, may even superficially resemble a barbell. The common feature shared by all exercise machines is *the absence of the ability to fall down while you use them*.

This seemingly minor detail cannot be overemphasized: normal human movement – the circumstances under which we use our bodies to interact with our environment every day – is an exceedingly complex task. It is the result of the cumulative efforts of hundreds of muscles moving hundreds of skeletal components under the control of thousands of nerves. You must not only balance your own body weight over the middle of your feet as you move through the day (an increasingly difficult task for the frail-trending elderly population), but every physical object with which you interact demands the coordinated interplay of your strength and its mass.

Furthermore, the normal application of strength in daily tasks, and most especially in sports, involves the capacity for doing so from a position of un-balance. The term “field strength” has been applied to the great athlete's ability to exert high amounts of force even when the body is in a position of unbalance itself. Strength is increased most effectively while balanced evenly on two feet, because that's where the most weight can be lifted. But field athletics and often life itself demand the ability to express that strength from less-than-optimum positions. This ability is considered to be a talent some are born with, but whatever the genetic role in field strength, increasing the “strength” component improves the ability.

An even more important consideration for machine exercisers is the constrained, artificial movement patterns enforced by the design of the device. The normal way for legs to move is knees and hips flexing and extending in a coordinated fashion. Agonists and antagonists functioning simultaneously, calves, hamstrings, quads, and hip muscles all working together – you know, squats and deadlifts, running and walking. Sitting on a machine with your butt held down in the seat by your hands with your knees extending all by themselves, or flexing your elbows while your shoulders and upper arms are held motionless, well, that's just stupid. And it's an excellent recipe for overuse injuries, since one moving joint amid several others held artificially motionless forces tendons and ligaments to do things they aren't designed for. Moving Arthur Jones's machine handles through Arthur's idea of the perfect movement for an isolated muscle group falls woefully short of adequate physical preparation, for both sports and life.

Overreaction is usually counterproductive.

Many people have grasped the problem with machine-based exercise, and many have even over-reacted. The latest trend in exercise is known in the industry as “functional training.” Since it doesn't resemble anything you normally do with your body, it is not “functional,” and since the exercises cannot be programmed to produce long-term progress, it is not “training” either.

Consisting almost entirely of relatively light weights moved with one hand at a time while solving a complex balance problem on one leg at a time, this type of exercise has removed progressively higher amounts of force production as even an option, and replaced it with *not falling down* as the

Barbells vs Machines vs Everything Else

primary objective. Any exercise performed on wobble boards, bosu balls, or any unstable surface, or that is performed on one leg at a time, cannot be performed with enough weight that force production against the resistance is the limiting factor, and thus continuously increasing strength cannot be the adaptation.

It is important to learn to not fall down when you squat, press, and deadlift, and everybody learns how the first day. From that point forward, not falling down is a factor that is always present, but it is not the bottleneck – *the ability to produce enough force to lift the increasingly heavier barbell* while not falling down is the objective. Not falling down is merely a condition you have already mastered, not a new problem every day, sufficiently difficult that it prevents your getting stronger.

Again, strength – the ability to produce force against an external resistance – is the basis of your physical existence. There is only one kind of strength, the kind your contracting muscles produce against your skeletal components as they interact with the ground and with objects you manipulate with your hands. Building strength means that you have increased your ability to produce force, which requires the use of progressively heavier weights. The use of machines is an inefficient way to accomplish this, since the ability to progress is limited by the inherent nature of isolation exercise. The absence of a balance variable limits the ability of the exercise to build “functional” strength that can be applied in normal human physical circumstances. Conversely, the use of light weights is antithetical to the purpose of increasing strength, and unstable surfaces create conditions which fatally limit the weight that can be used. Getting strong is very important, and barbell training is the best way.

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