

Improving Endurance

Arthur Jones

Up to this point, in previous chapters, I have pointedly avoided the use of the word “endurance”...because it has a different meaning to different people. Although a common word, it is commonly misunderstood.

Endurance, as I will use the word hereinafter, means “muscular endurance”...the ability of a muscle to perform repeatedly with a less than maximum load during anaerobic (non-steady-state) work.

I will enlarge upon the above definition later, but first I want to mention some factors that endurance is not related to...not, at least, in the sense that I will use the word in this book. Endurance is not related to the heart, or the lungs. It has nothing to do with cardiovascular or cardiopulmonary ability.

When most people use the word endurance, they are really not talking about the ability of the muscles at all...instead, the usually mean “wind” or “condition”.

If an athlete is forced to stop an exercise, or any physical activity, because his “wind” has failed him...it does not necessarily follow that his muscles have also failed.

Weightlifters and bodybuilders, who usually do little or nothing in the way of exercise that improves their “wind”, or cardiovascular ability could not perform a low resistance, high repetition exercise even if they tried. But they would be forced to stop by the failure of their lungs...not because of a failure of the muscles.

So such people do have “muscular endurance”...but they usually have very little “cardiovascular endurance”...or cardiopulmonary endurance...or wind...or condition. Call it what you may, it amounts to the same thing.

Several years ago, during a demonstration of basic exercises given for the purpose of teaching the members of a high school football team proper form required in these exercises, my son performed 17 repetitions of the squat while using 250 pounds.

And during a strength test of this same football team, the strongest member of the team barely managed one repetition with 255 pounds...just 5 pounds more than my son used for 17 repetitions.

Whereupon, the coach remarked to me...”Well, your son has more ENDURANCE than my boys, but my boys are stronger than he is.”

Which, of course, is ridiculous. The ability to perform 17 repetitions with a given weight, clearly and undeniably establishes the fact that you could have performed one repetition with a considerably higher weight.

In fact, only one day or two earlier, my son had performed 11 repetitions in the squat with 320 pounds during a demonstration for the coaches of this team. Including the same coach that made the above mentioned remark.

Which example is not meant to imply that the above mentioned coach is stupid...on the contrary, the individual in question probably has a better than average knowledge of this type of exercise. But, like all of us, he has accepted certain widespread beliefs as “fact”...and never really stopped to think about them logically.

As a result of this widespread misunderstanding, most people, when they use the word “endurance”, are really thinking of the ability of the heart and lungs.

But when I use the word endurance I am speaking of a particular muscular ability.

If a man goes into a gym when he is fresh and rested, and if he performs a maximum-attempt bench-press with 300 pounds...and if he immediately tries to perform a second repetition, but fails...then he has tested his “strength” in the bench-press.

But probably without realizing it, he has also tested his “endurance”...because, in fact, the two factors are directly related. If you are aware of one, then you should know the other. Because, the existing momentary level of one factor clearly indicates the momentary level of the other.

“Strength” and “endurance” go up and down in direct proportion to each other. If you increase your strength 50 percent, then you have increased your endurance by the same amount, and vice versa.

For example...if, after a year of training you find you can perform 10 repetitions in the bench-press with 250 pounds...or one repetition with 300 pounds...then you should be aware of your individual “strength to endurance” ratio, and thereafter you should always be able to accurately estimate one factor by testing the other factor. Because they will go up or down while maintaining that same relationship.

In the above example the ratio is 5 to 6...which is about an average ratio, although a certain amount of variation will be noted on an individual basis.

A ratio of 5 to 6 means that your strength for ten repetitions will indicate your strength for one repetition, at that ratio...if you can perform 10 repetitions with 5 pounds, then you can 1 repetition with 6 pounds.

For example. Let us assume that you can perform 10 repetitions with 100 pounds in the curl, and you wish to know your strength level for one repetition in the curl. Merely divide 100 pounds by 5...which will give you a figure of 20...and then multiply 20 by 6, which will give you a figure of 120. And 120 pounds would be your ability for one repetition.

Or...if you could bench-press 300 pounds for 10 repetitions..divide 300 by 5, which will give you 60...then multiply 60 by 6, which will give you 360. And 360 would be your strength level for a single repetition.

A ratio of 5 to 6 may not be your particular, individual ratio...but that is a close figure for almost anybody. And it is a fairly simple matter to determine your own ratio for yourself...and having done so, you can afterwards use it as a constant and very accurate gauge of your actual strength for a single repetition.

But please note carefully that this ratio will apply ONLY in cases where you are dealing with pure "strength"...if a particular exercise involves skill, or great speed, or balance, then you might fail in a situation where your strength was high enough but your form was off at the moment.

So don't attempt to apply this ratio to quick lifts like the clean and jerk or snatch, or any other lift except a simple movement involving little or no skill.

And once you are aware of your own individual ratio, you have the advantage of knowing your existing strength level at all times...without the necessity, and without the danger of testing it.

But, as this point I want to mention that this ratio will hold true only during anaerobic work...only if the resistance is fairly high.

You are performing anaerobic work when the resistance is high enough to prevent continuous work at that level of intensity, and at that pace. If the work can be continued more or less indefinitely, then you are performing aerobic work.

If you bench-press 300 pounds and...then fail when attempting a second repetition...you failed with the second repetition because the muscles did not have enough time to recuperate. The fuel and oxygen that were stored in the muscles were enough to permit the first repetition, but were depleted to some degree by the first repetition...and the amount of fuel and oxygen that remained was not enough to permit a second repetition.

As soon as the existing stores of fuel and oxygen that are stored in a muscle are depleted by work, the body immediately starts replacing them...but such replacements takes time, and if you work the muscles so fast that you are using up the stores of fuel and oxygen faster than they can be replaced, then the muscle will eventually reach a point of failure.

A single repetition or an exercise, regardless of the actual weight involved, never uses up all of the available fuel and oxygen stored in the muscles...but it does use part of them. And if the lift is heavy enough, then the remaining, unused stores are not enough to permit a second repetition with the same resistance.

If, instead of taking your maximum weight, you used a somewhat lighter weight...then you could probably perform several repetitions. A number of repetitions are now possible for several reasons...(1) the first repetition uses part of the fuel/air, but leaves enough for a second repetition...(2) the second repetition uses exactly the same amount of fuel/air as the first repetition did, and leaves enough for a third repetition...(3) but the reserve is being rapidly reduced because the individual repetitions are using up the fuel/air faster than the body is replacing it...(4) so, eventually, you reach a point where the momentary supply of fuel/air is not enough to permit another repetition, and then you fail. Such work is anaerobic... or “non-steady-state.”

However, if the weight was much lower, then the fuel/air requirements for each repetition might not be as high as the body’s ability to replace it...in which case you could continue almost indefinitely. In this case, the work is aerobic...or “steady-state”.

In general, aerobic (steady-state) work is required for improving cardiovascular ability, “wind”, or “condition”...the ability of the heart and lungs. And such work will do very little in the way of building strength.

And, in general, anaerobic (non-steady-state) work is required for increasing muscular mass and strength...and, as usually practiced in weightlifting in bodybuilding circles, such work will do little or nothing for improving cardiovascular ability.

With the clear understanding that the following figures are NOT intended to be meaningful in any sense except for my purpose in the following example, I will attempt to show in simple mathematical terms just what happens during a set of five repetitions of anaerobic work.

Let us suppose that your starting level of fuel/air was 500 “units”...and let us also suppose that one repetition of the bench-press burns up 60 units of fuel/air...and let us suppose that a level of 360 units of fuel/air is required to bench press 300 pounds.

First repetition...
With a starting level of.....500 units
The first repetition consumes.....60 units
Leaving only.....440 units
But the body replaces.....20 units
Giving a momentary level of.....460 units

And so on repetition by repetition, so that by the time you reach the final repetition, the fifth repetition, the situation is as follows.

Fifth repetition...
With a starting level of only.....380 units
The fifth repetition consumes.....60 units
Leaving only.....360 units
And again the body replaces.....20 units
Giving a momentary level of.....340 units

But 340 units is not enough to permit you to continue...since a level of 360 units is required to permit a repetition with that amount of resistance. So you fail.

But you just barely fail...you could almost do another repetition, but not quite.

Such work is anaerobic work...the type of work required for the development of muscular mass and strength.

An understanding of the above example should also make it clear why the final repetition feels so much harder than the first repetition. During the first repetition you are using a much lower proportion of your momentary ability...and during the last repetition, you are using very close to 100% of your momentary ability. So, repetition by repetition, the intensity of effort is constantly increasing...although every other factor remains unchanged.

When such anaerobic work is performed regularly, you are exposing your muscles to the "overload" principle of exercise...and they will respond by increasing their size and strength.

Apparently the body attempts to maintain a certain (but unknown) percentage of reserve ability, probably as a hedge against emergency needs...if you force the muscles to work at a level close to the limits of momentary ability, then little or nothing is being left for emergency use, and the body tries to re-establish the previously existing percentage of reserve strength. And the only way it can provide the reserve strength is by increasing its muscular mass, and thus its strength.

And...anything you do that results in increasing your strength, will also increase your muscular endurance in direct proportion, since strength and endurance are, in a sense, one and the same thing.