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Progressive Exercise

Below a certain threshold of intensity, exercise will do little or nothing in the way of increasing strength. But if the intensity is high enough, a very brief program of exercise will produce rapid increases in strength if training is truly progressive.

We have already mentioned three factors that have never been satisfactorily defined – *intensity*, *strength*, and *progressive*. Until and unless we reach an understanding of those terms, no meaningful discussion of exercise is possible. We do not suggest that our definitions are the only possible definitions, but we do feel that they are satisfactory for our purposes here.

Intensity, as we will use the term, means *muscular intensity*. Maximum intensity is involved only when a muscle is pulling as hard as momentarily possible, producing as much force as it is capable of producing at that moment. A moment's consideration thus makes it obvious that intensity cannot be determined by measuring output. The following example should make this clear.

If a 100-pound barbell is resting on a platform scale, the weight will produce a downwards force of 100 pounds and the scale will register 100 pounds. But if the trainee grasps the barbell and exerts a force of 50 pounds in an upwards direction, then the scale will register only 50 pounds. Note carefully that the barbell will not move. If the trainee were pulling as hard as momentarily possible, then the intensity would be maximum. But if he were not pulling as hard as possible, then it is probably impossible to measure the intensity that was involved. In both cases we were accurately measuring the output, but intensity was determined only when it was maximum.

During a normal set of 10 repetitions with a barbell, the level of intensity varies from repetition to repetition, constantly increases, and is maximum only during the final repetition, and then only if the final repetition leads to a point of momentary failure. If it was possible to perform an eleventh repetition, then the intensity never reached a maximum level. Maximum intensity is produced only if an exercise is carried to a point where another repetition is momentarily impossible. So we can measure maximum intensity, but only under certain circumstances.

During the first repetition of a set of 10 repetitions, the intensity is low, even though the output is actually higher during the first repetition than it is during the final repetition. An example follows.

If a trainee curls a 100-pound barbell in a strict manner, performing 10 repetitions and failing during an attempt to perform an eleventh repetition, then the output is high and the intensity is low during the first repetition, and the output is low and the intensity is high during the tenth repetition. During the first repetition the trainee was momentarily capable of doing more, and could have lifted more weight than he was lifting. The weight was lifted, thus the output was high, but it was lifted easily, so the intensity was low. During the tenth repetition the trainee was not momentarily capable of doing more. If the weight had been any heavier, then he could not have lifted it. So again the weight was lifted, but it was lifted slower, thus the output was lower than it was during the first repetition, and since the trainee was working as hard as possible, the intensity was high.

It should now be obvious that intensity is a relative situation depending upon momentary ability, varying moment by moment, and not directly related to output. If the trainee could have done more, but did not, then the intensity was low. But the intensity is maximum if he is doing all he can at the moment regardless of how much or how little output is actually involved.

It should also be mentioned that the production of force is relative to output, and can be measured, but a high level of force is not required for high intensity. In fact, if exercises are performed properly, then the maximum intensity repetitions will actually involve less force. It is easily possible and very desirable to have high intensity and low force at the same time. A failure to understand this simple point has led to a ridiculous situation that is very commonly encountered in exercise programs.

Many, perhaps most, trainees avoid the final two or three repetitions in a set under the totally mistaken belief that they are thus avoiding the most dangerous repetitions. In fact, the final repetitions are actually the safest, because the output is lower, the production of force is lower. During the final repetition the trainee is imposing less pulling force on his muscular attachments than he was during the first few repetitions.

In practice, thousands of trainees avoid the most productive repetitions under the false impression that they are thus avoiding the dangerous repetitions. But they have already performed the most dangerous repetitions. As a direct consequence, most trainees produce results that are far below optimum results, because a very high percentage of the strength increases produced by exercise is a direct result of high intensity, which is involved only in the final two or three repetitions.

Several years of exercise that is stopped three repetitions short of a point of momentary failure will not produce results equal to those that can be produced in a matter of a few weeks by an otherwise exactly similar training program that is carried to a point of momentary failure.

The final two or three repetitions are merely preparation and do little or nothing in the way of increasing strength. These repetitions are of little value because the intensity is low. The final repetitions are productive because the intensity is high.

Since the facts in this case, simple and undeniable though they are, run directly contrary to very widespread belief, it will be a long time before this point is understood and accepted by a high percentage of trainees or coaches. In the meantime, most strength programs will consist primarily of wasted effort. Millions of man-hours of training and billions of foot-pounds of effort will be devoted to programs that produce little if anything of value.

Gains in strength will come slowly, if at all. Trainees will lose interest from lack of progress, and coaches will look elsewhere in search of some secret to more rapid strength increases. Many trainees (and coaches) will make the mistake of equating more with better. When progress is less than expected, they will increase the amount of training, under the mistake of equating more with better. When progress is less than expected, they will increase the amount of training, under the mistaken belief that training more means training harder. In fact, all that is required is an increase in the intensity of exercise.

Most trainees who do stick to a strength program for a long period of time eventually fall into a pattern of training where their workouts are about as productive as walking cross-country on a treadmill. The intensity of their workouts is seldom if ever high enough to stimulate strength increases, but the amount of training is so high that they remain in a constantly run-down condition.

Under such circumstances, growth is seldom stimulated but will be slow in all cases, and impossible in many cases, because the recovery ability will be constantly forced to work as hard as possible merely to replace the large amount of energy that is required, leaving nothing as a reserve for growth.

It must be clearly understood that high-intensity training and a large amount of training are mutually exclusive factors. A trainee can have one or the other, but not both. If he doubles the intensity of training, then he must reduce the amount of training by more than 80 percent in order to compensate for the increased intensity. If not, then he will produce losses in strength instead of gains.

Since it is very difficult to measure an intensity level less than maximum, how do we prove that point? How can we test such a theory? Very easily. A trainee should determine just how much weight he can curl for ten repetitions in perfect form with an eleventh repetition being impossible.

Let us assume this weight turns out to be 100 pounds. Then use exactly half as much weight, 50 pounds, and perform 20 sets of curls with this reduced weight during each of three weekly training sessions. After six months of such training, with no other training of any kind, the trainee should test his ability with 100 pounds again and not be surprised if he is actually weaker than he was at the start. He probably will not be weaker, but he will certainly be a little, if any, stronger. A large amount of low-intensity exercise did very little for increasing strength, probably nothing, and may even have produced losses.

Now, double the weight, go back to the 100 pounds and perform 20 sets of as many repetitions as possible with 100 pounds. Perform as many repetitions as possible in each set, because the trainee will not be capable of performing 10 repetitions in each of 20 sets during the same workout. Again follow a program of three weekly workouts, 20 sets of curls in each workout, and no other exercise. Watch what happens, and the trainee should not be surprised by the fact that he will lose strength rapidly, and grow steadily weaker. At least he would if such a comparison was made using exercises for all the major muscular structures of the body.

Recovery ability is an *overall* thing. It is related to the system as a whole. An individual muscle (such as the biceps) is capable of very rapid recovery from an enormous amount of work if the recovery ability of the system is not depleted.

Testing one muscle in isolation is not a good test, because one small muscle can perform a great deal of work without imposing much strain on the recovery ability. A better test would involve larger muscles, for example an exercise such as the squat. But for actually valid results, a test should involve a variety of exercises, at least 8 basic exercises, covering all of the major muscular structures. When such a valid test is conducted, the results can be accurately predicted in advance.

A large amount of low-intensity exercise will do little or nothing in the way of increasing strength, and a large amount of high-intensity exercise will produce losses in strength. Instead, if the trainee reduced the number of sets to only 1-2, instead of 20, and doubled the weight used during the large amount of low-intensity exercise, then rapid and steady strength increases would be produced as long as each set was continued to a point of failure. In such a case, he would be performing only 20 percent as much exercise insofar as amount of exercise is concerned – 10 percent as many sets, but twice as much weight. Obviously, then the amount of exercise was reduced by 80 percent by comparison to the low-intensity exercise program. Yet the results would be much better.

In spite of all of the clear evidence, most trainees still persist in doing more when they should be working less, but working harder. To produce good results from exercise, trainees must work harder, and if they work harder, then they must work less.

Strength

Strength has never been properly defined, but until we agree on an acceptable meaning, no reasonable discussion of strength training (or exercise) is possible. First, we think it is necessary to realize that the strength of one man can never be fairly compared to that of another. Far too many variables are involved to permit such a comparison.

How far was the weight lifted? Did each man lift it an equal distance? If not, then the comparison was invalid. How fast was the weight lifted? Was the speed of movement exactly the same in both cases? If not, then the production of power was different even if the weight was the same in both cases, and even if the distance of movement was also equal.

What about skill? Was that exactly equal? Two men will never be exactly equal. They will always be unequal in too many ways to permit accurate strength comparisons.

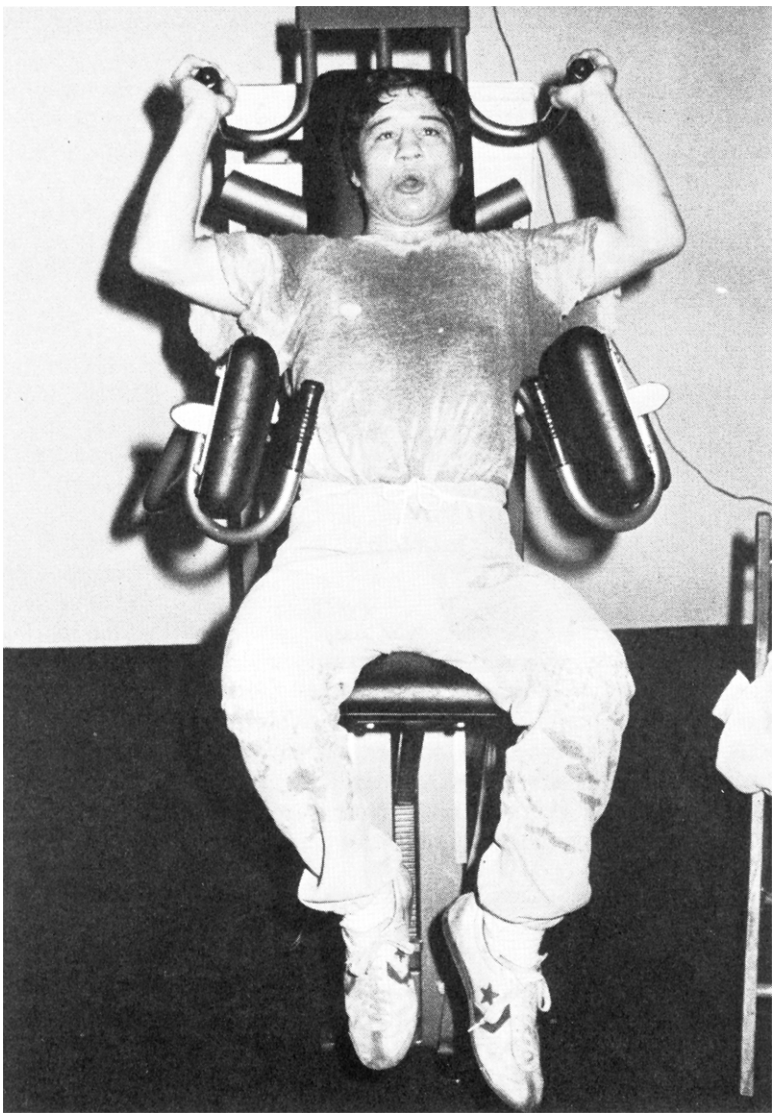
It should also be noted from the start that it is not necessary to compare a man's strength to that of another man. For our purposes, we need compare a man only to himself at another point in time.

Exercise performed for the purpose of increasing strength is productive if a man's strength is increasing, increasing in relation to his strength at an earlier point in time. It is easily possible to greatly increase a man's *apparent strength* or his *demonstrable strength* by merely teaching him a better style of lifting while doing absolutely nothing in the way of increasing his actual strength.

We think *actual strength* increases should only be measured by comparing performances that are exactly the same in all respects except the amount of weight involved. We also feel that such comparisons should involve only movements that are performed in a fairly slow speed, and in perfect form.

We do not believe in the validity of maximum, single-attempt lifts. For example, a man might bench press 200 pounds, and then be unable to perform a second repetition with the same weight. Later, he might use 300 pounds and again fail when trying a second repetition with the same weight.

Is he thus 50 percent stronger? Perhaps, but perhaps not. He might be more than 50 percent stronger, or less than 50 percent stronger. During the first test, he might have been capable of using 210 pounds, if he had tried it instead of the 200. During the second test, he might have been capable of 310, but having reduced his strength by the lift with 300, he was then unable to demonstrate his actual level of strength on that day.



Such comparisons of maximum-attempt lifts are only fairly accurate at best and usually, in practice, fall far short of real accuracy of measurement.

A much better comparison of strength, we feel, is based on an ability to perform several repetitions, a reasonable number from about 6 to 12, as long as the number is always the same, and as long as each set leads to a point of failure.

The problem here stems from the fact that sets carried to a point of failure do not always result in the same number of repetitions, and how can 8 repetitions with 200 pounds be compared reasonably to 11 repetitions with 240 pounds?

Such a comparison cannot be made beyond noting that the second performance indicated a *stronger* performance. This is not the perfect system of measuring strength, but it is the best one we have found in more than 30 years of looking.

In practice, using the same system of strength measurement means that comparisons cannot be made on a day-by-day basis, except in general terms, which, for our purposes, is actually the best method of charting strength increases. While we will not always know the exact strength level at a particular point in time, we will be instantly aware of changes in strength, either increases or losses.

For example, if a trainee performs 7 repetitions with 200 pounds on Monday, and then 8 with 200 on Wednesday, he is obviously stronger, even though we do not know exactly how much stronger. But if he does 7 with 200 on Monday, and then only 6 on Wednesday, then he is weaker and is losing strength. For all practical purposes, a trainee will produce sets that do result in exactly the same number of repetitions often enough to give a very accurate chart of his progress.

We can hear the howls of protest from some quarters – “But that is not measuring strength, that is endurance.” We might as well settle that point here and now, or at least try to settle it, being well aware in advance that many people will never accept the facts in the matter – having misunderstood the relationship between *strength* and *endurance* for too many years.

Some people will die with the firm belief that strength is one thing and that endurance is something else. In fact, they are one and the same thing, exactly the same thing, and if one is measured accurately, then the other is obvious, or should be.

This brings us to the definition of endurance. Keep it clearly in mind that we mean muscular endurance. We are not talking about cardiovascular ability, or cardiopulmonary ability. We are not talking about the ability of the heart or lungs. We are talking about the ability of the muscles to perform several consecutive repetitions repeatedly with a weight that could be lifted for one maximum attempt repetition.

As long as the weight and the speed of performance are such that a trainee reaches a point of failure after 6 to 12 repetitions, then he is testing strength as well as endurance. If the weight is so light that the number of repetitions becomes very high, then other factors come into play, and the test is no longer valid for testing either strength or endurance of the muscle itself. Such high repetition, low-resistance exercises will not do much in the way of building strength in any case, so we need not concern ourselves with them.

A great deal of confusion on this point probably arises from attempts to compare one man's strength to another man's endurance, which simply cannot be done with anything approaching accuracy. If we restrict our attempts to measure strength, or endurance, to comparisons between two or more different performances by the same man, we will avoid most of the problems leading to misunderstanding.

What frequently happens is something like the following. On a particular date, during the same workout, a man bench presses 300 pounds for one maximum-attempt repetition, and performs 10 repetitions with 250 pounds, failing when he attempts an eleventh repetition. Then he stops training for a period of several weeks, during which period of time his strength declines.

Upon starting to train again, he knows he cannot duplicate the 300-pound lift so he does not attempt it. He guesses that perhaps his strength has declined by 10 percent, reduces the bar by that percentage, takes 270 pounds for his maximum attempt, and makes it about as easily as he previously lifted the 300 pounds. He is correct in his impression that his strength had declined by 10 percent. Then he makes the mistake that leads to a false conclusion. He takes 250 pounds to test his endurance, and is able to perform only 4 repetitions, instead of the 10 he did previously.

He wrongly assumes from this result that his endurance has declined by 60 percent while his strength went down only 10 percent. Thus he thinks his endurance dropped much more than his strength, but he thinks wrong. The test was invalid.

To be valid, he would have to test his endurance with 225 pounds. He would have to reduce the endurance test weight by exactly the same percentage that he reduced the weight test weight, not reduce it by the same amount, but by the same percentage. If he did so, then he would have been able to perform 10 repetitions, exactly the same number that he did previously with the heavier weight.

It would then be obvious that his strength and endurance declined in exact proportion to each other. They would go up and down together, maintaining a definite relationship.

If at a particular point in time, a trainee can bench press 200 pounds ten times and can lift 240 pounds once, then the ability to perform two repetitions at a later point in time with 400 pounds will indicate that the individual has the strength to lift 480 pounds once. Thus, if he doubles his endurance he has also doubled his strength to the extent that style and confidence do not become involved, and to the extent that strength means the ability of a muscle to produce force.

Failing to understand this point, simple and undeniable as it actually is, or failing to agree with the explanation which we consider to be perfectly clear and beyond dispute, some readers will be turned off by anything else we have to say. But we think it only fair to remind these readers that the only rational reason for reading any of this is an attempt to learn something. If, however, they are merely looking for additional confirmation of firmly-held beliefs, then we would strongly advise them to skip the rest of our writing. Because careful research and simple logic have already taught us that most of the current beliefs on the subject of exercise are without basis in fact, and experience has taught us that many people are apparently unwilling to change their beliefs, regardless of the evidence that is presented.

We are well aware in advance that even mention of controversial subjects such as relationship between strength and endurance will close the minds of many readers, we also know that the entire field of exercise will remain firm in the presently existing dark ages until and unless the light of logic is turned on the subject.

Therefore, in later chapters, I will clearly outline the practical *how to do it* and *what results to expect* from what type of programs. I will also outline the requirements that are required for producing the maximum degree of results from exercise at this point in time, the state of the art being what it is, with the knowledge that presently exists.

In fact, instructions for producing maximum results from exercise can be reduced to four works: *train hard, train briefly.*