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The Fifth Step

The individual fibers of muscles function in accordance with the well-known – but widely misunderstood – principle of so-called "all or nothing function". In effect, a fiber is working as hard as possible – or not at all. A movement against light resistance does not involve a small amount of work on the part of all of the fibers in the muscles contributing to the movement; instead, only a few fibers are involved at all – the minimum number of fibers that are required to move the imposed resistance – and the remainder of the fibers are not involved at all. But the fibers that are working, are working as hard as possible – as hard as possible AT THAT MOMENT.

One individual fiber may be involved in each of several repetitions in a set of an exercise – but it will not contribute an equal amount of power to each of the several movements; it will always be working as hard as possible – or not working at all – but its strength will decline as the exercise progresses.

Thus, in practice, a set might involve a number of fibers in much the following fashion; the first repetition might involve ten fibers, with each fiber contributing ten "units of power" to the movement – the second repetition might involve the same ten fibers, which then contribute only nine units of power each, and one previously uninvolved fiber (an eleventh fiber, a fresh fiber) which contributes ten units of power, brings the total power production in the second repetition up to the same level as that involved in the first repetition – the third repetition might involve the same initially-used ten fibers, with each of them now contributing only 8.1 (eight and one-tenth) units of power, plus the eleventh fiber that was used previously only during the second repetition, and which now contributes nine units of power, plus a twelfth fiber, a fresh fiber that is involved for the first time only during the third repetition and contributes ten units of power.

Thus each of the first three repetitions would result in exactly the same amount of power production – and all of the involved fibers would always be contributing to the limit of their momentary ability; but the fibers would not be contributing equally, and the actual number of involved fibers would change from repetition to repetition.

If the set was ended at that point, then little or nothing in the way of growth stimulation was produced – because none of the fibers were worked very hard, and because there were still unused fibers in reserve.

In order to produce significant growth stimulation, the set must be continued to a point where as many as possible of the available fibers have been involved – and where at least some of the fibers have been worked to a point of total failure, until they simply quit, refusing to function at all.

If the set had been continued beyond the third repetition, then eventually a point would have been reached where the total power production started to decline – where it was no longer possible to move the weight as rapidly as it was moved during each of the first three repetitions; this would happen when the total contributions of all of the fibers that were still functioning added up to a lower amount of power than that which was involved in each of the first three repetitions – and at that point, you could still continue (and should still continue), but you would be forced to continue at a reduced speed, with reduced power.

For best results in the way of growth-stimulation, the set should be continued to a point of failure while still maintaining good form – and then two or three cheated repetitions should be performed, as described in the preceding chapter.

With this style of training, you will involve as high a percentage of the total number of fibers as it is possible to involve in any particular exercise – and you will work some of the fibers to the point of utter failure; both of which results are highly desirable – since they obviously involve working the muscles well inside their momentary levels of reserve ability.

But it should be remembered that the system tries to maintain a level of ability that it has previously accepted as normal, and it will rebel against workloads of this intensity; the sensory portion of the regulatory mechanism is fully capable of recognizing an emergency situation that actually requires the utilization of reserve ability, and it will not easily permit use of the reserve ability in an obviously non-emergency situation – thus you will be exposed to "pressures" of various types, signals hopefully intended to bring the exercise to a halt before it becomes necessary to involve the reserve ability. The exercise will be painful – you may feel slightly nauseated, especially the first time you try working that hard –and there will be strong overall "desire to quit".

Unless you are willing to ignore theses signals, and work to the actual point of failure, then long-range progress will be strictly limited to a very slow average rate of growth; but if you are willing to ignore them –and do ignore them, and do work regularly to the actual point of failure –then such "cease and desist" signals will quickly stop bothering you, the pain will no longer occur, the nausea won't return, and you will be able to continue to an actual point of failure without a constant desire to quit.

The system apparently maintains at least two separate sources of reserve ability; which we might define as a "surplus of fibers" reserve and a "chemical" reserve – and while the system will permit work inside the "surplus of fibers" reserve, although it will discourage such an intensity of work in non-emergency situations if it can, it usually will not permit work inside the level of ability possible from the "chemical" reserve's contribution in anything except an emergency.

In an actual emergency, the sensory portion of the regulatory mechanism quickly recognizes the possible need for a level of ability far above normal – and it triggers a chemical response which greatly, but temporarily, increases the existing level of usable strength; but under normal circumstances, it is NOT desirable to work inside the levels of reserve ability provided by this form of chemical "supercharging" – because, among other things, doing so exerts an enormous drain on the overall recovery ability. The possible benefits are far outweighed by the very real disadvantages; some of the possible results are ulcers, heart attacks, extreme nervousness, and premature aging.

But while the "chemical" reserve should be retained for emergency use only, the "surplus of fibers" reserve must be used regularly if a fast rate of growth is desirable – and it can be used safely; the only result from overuse would be eventual exhaustion, which would finally result in a complete halt to training of any kind. But, if properly used, which means "with maximum-possible intensity of effort", very "briefly" and "infrequently", then such a style of training will produce maximum-possible gains in size-strength with no adverse effects.

But since such a style of training never becomes "easy" – although it will cease being painful, and will quit making you sick, after the first few actually hard workouts – it is very easy to gradually slip back into a much easier style of training, frequently without even being aware that you are doing so. For that reason, it is a very good idea to keep a careful watch on your actual rate of progress – and this can only be done in a logical manner by charting your strength increases; but do NOT attempt to chart your strength increases on the basis of your ability in single-repetition, maximum-possible attempts – instead, use a particular number of repetitions (almost any reasonable number of repetitions, except one repetition) as an indication of your ability. When you can perform ten repetitions with 200 pounds, then you are twice as strong as you were when you could perform ten repetitions with only 100 pounds.

When you can perform ten repetitions with 200 pounds – and previously you could perform only eight repetitions with 200 pounds – then you are "stronger" than you were; but there is no real agreement as to just how much stronger you are. So, for the greatest accuracy in charting strength increases, compare only those sets that result in a particular number of full repetitions performed in good form; if you are using ten repetitions as a basis for comparison, then ignore any sets that result in any other number of repetitions – over a reasonable period of time, there will always be enough sets that do result in ten repetitions to provide regular checks on your progress.

Numerous writers have mentioned the relationship of the size of a muscle to its existing level of strength; but they usually do so in a fashion that leaves a great deal to be desired at the very least, in a fashion that leaves the average reader in a state of total confusion, not knowing just what was meant – some writers will state that there is a direct relationship between the "area of the cross-section of a muscle" and existing strength – other writers put it differently, by comparing the "diameter of the cross-section of a muscle" and existing strength – but regardless of how it is worded, it still means the same thing, the SIZE of a muscle indicates the STRENGTH of a muscle, and vice versa.

Now, for the benefit of those people who might wish to dispute my above statement on technical grounds, I will point out the fact that a muscle changes its LENGTH very little if at all as a result of growth; so we are NOT dealing with an ever-increasing sphere – instead, for all practical purposes, we are dealing with a cylinder of constant length, and thus, if we double the area of the cross-section we will simultaneously double the mass, and if we increase the diameter of the cross-section of a muscle by a factor of approximately 1.4 (one and four tenths) then we will double the area of the cross-section, and also double the mass, AND ALSO DOUBLE THE POWER POTENTIAL of the muscle – as least insofar as the "input" of power is concerned, although the lowered efficiency resulting from unavoidable changes in the "angle of pull" may not (probably will not) permit a doubling of measurable power, or power "output".

Because of such ambiguous wording – such unclear statements in situations where clear expression is not only possible but highly desirable, even an absolute requirement – most current weight-trainees remain totally; unaware of the simple fact that the size of a muscle is directly related to its strength; and since most bodybuilders are interested only in "size" – and since they remain unaware that size is impossible without strength, and vice versa – they ignore the only type of training that is capable of giving them the size they are seeking, strength training. And competitive weight-lifters are just as confused – not realizing that increasing their muscular size will also increase their strength, MUST increase their strength.

So now we can add the following points to our ever-growing list of basic points . . .

16. Individual muscle fibers perform on an "all or nothing" basis; and only the number of fibers that are actually required to move a particular amount of resistance are involved in any movement.

17. A set that is terminated prior to the point of failure will not involve (cannot involve) all of the available fibers; at least not to a significant degree.

18. Every set of every exercise should involve work as far as possible inside the existing level of the "surplus of fibers" reserve ability.

19. Careful attention should be given to the actual rate of progress, in order to prevent a gradual and probably unnoticed reduction in the intensity of effort.

20. Accurate charting of progress can only be based on measurable strength increases.

21. There is a direct relationship between the size of a muscle and the strength of the same muscle.