

# Nautilus Bulletin #2

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## The Seventh Step

A workout is one thing – a competitive weight-lifting meet is something else, an entirely different thing; or, at least, it should be an entirely different thing – since the best way to build strength has very little in common with the best way to demonstrate strength. Yet many current trainees make the mistake of training as if they were in a contest – perhaps being more interested in attempts to impress their training associates than in trying to build strength, or maybe just unaware of the actual facts.

Olympic lifters and power lifters obviously must practice maximum-possible, single-attempt lifts – both in training and in competition; but there is absolutely no reason – and even less excuse – for bodybuilders to ever attempt heavy "singles". While it should now be clear that maximum-possible muscular size cannot be produced without maximum-possible muscular strength, it does not follow that building maximum-possible strength requires the performance of heavy single-attempt lifts; on the contrary, greater strength and size will result from the performance of sets of at least several repetitions.

Secondly, it is easily possible to build the muscular strength to such a level that it literally becomes dangerous to employ this strength in maximum-possible single-attempt lifts; which might lead some people to ask, ". . . then what is the value of such strength, if it is dangerous to use?"

But since it is not my purpose to examine the "value" of building great size and strength – but, rather, to discuss the best method for doing so – I will not become involved on that point in great detail; however, I will mention that great strength – even a level of strength that might be unsafe in some applications – obviously provides a reserve that actually improves the safety of any normal activity, since the system is then normally operating at a level well within safe limits, at a level which imposes no strain.

Maximum-possible strength-size absolutely CAN be produced without ever producing maximum-possible power – even though maximum power production is a requirement for maximum growth –stimulation, and there is no paradox involved in this situation; for maximum growth-stimulation, it is only necessary to produce the MOMENTARILY maximum-possible amount of power – and this can be done (and SHOULD be done) only after the momentary ability has been reduced by the performance of at least three immediately-preceding repetitions that did NOT involve maximum power production. In effect, by the time you do produce maximum power, your momentary ability will be reduced to the point where the danger of injury is greatly reduced.

This can easily be accomplished in practice by using a weight with which you can perform several consecutive repetitions – and by performing the first three or four such repetitions at a reduced speed, at a speed below maximum-possible speed; remember, power production involves three factors –resistance, distance of vertical movement, and speed-of-movement. And if you reduce the speed you are reducing the production of power in direct ratio –and reducing the danger of injury to an even greater degree; because, it is not the resistance that causes injury, it is your attempt to move (or to restrain the movement of) the resistance that causes injury, and the less power you are using, the less likely you are to produce injury.

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But, more than that, while a reduction in power production obviously reduces the pull on the connective tissues in direct ratio, such "slower than possible" movements also reduce the acceleration factor – a movement involving maximum-possible speed-of-movement will increase the acceleration factors (the "jerk" factors) far out of proportion to the increase in actual speed; momentum is the tendency shown by a moving mass to continue such movement –but it is also the tendency for a stationary mass to remain stationary –and the forces resulting from an attempt to suddenly accelerate a stationary mass enormously increase the "jerk" imposed upon whatever is connecting the source of power and the resistance, in this case the connection being the attachments of tendons and ligaments, and to a somewhat lower degree even the muscles themselves.

Thus, in practice, if "four units" of power applied against an immobile resistance imposes "four units" of strain (or "pull") on the connective tissues – eight units of power applied against the same amount of resistance will NOT impose eight units of strain; instead, it will impose SIXTEEN units of strain.

And sixteen units of power applied against the same resistance will impose two-hundred and fifty-six (256) units of strain; thus increasing the power application by a ratio of four to one will increase the strain by a ratio of sixty-four to one. So it should be obvious that the danger of injury rises at a much faster rate than the increase in power application.

People do not hurt themselves during a "first repetition" because they were not warmed-up properly – but because they are strongest at that point in the set, and because they make the mistake of moving at maximum speed at a time when this results in more pull from an increase in the power production and much more "jerk" from a resulting geometrical increase in the acceleration factor. And since single-attempt lifts are always "first repetitions," it should be obvious that they are the most dangerous type of movements – far more dangerous than might be apparent at first glance.

But since maximum-possible growth-stimulation can be induced by the production of MOMENTARILY maximum-possible power, almost all of the potential danger can be avoided; simply by reducing the existing level of ability before actually producing maximum-possible power – and this can easily be accomplished by performing three or four repetitions at a reduced speed-of-movement immediately prior to an actually maximum-possible movement – or it can be accomplished by "pre-exhausting" the muscles by working them in an isolated fashion immediately prior to involving them in a heavier compound movement.

Since the ability of the muscles to increase their strength is apparently far out of proportion to the ability of the connective tissues to increase their resistance to strain, it is almost inevitable that injuries will eventually result if you constantly make a practice of producing maximum-possible power during first repetitions – or while attempting heavy single-attempts; which, in plain English, means that practically all competitive lifters are almost certain to hurt themselves sooner or later –but in cases of competitive lifters, that is a risk that simply cannot be entirely avoided. You cannot hurt elephants without running at least some risk of getting stomped by an elephant – by you should at least be aware of the risk involved.

But it does not follow that even competitive lifters cannot at least reduce the risk to some degree – they can, to a rather great degree; supporting heavy weights in a variety of positions – with little or no attempt to actually move them, and with absolutely no attempt to move them suddenly –will apparently increase the "connective strength" of tendons and ligaments, and will do so without the enormous increase in the risk of injury resulting from the acceleration factors involved in fast movements.

The reader is requested to excuse my repetition in this chapter – but since this factor is of such actually great concern to anybody involved in weight-training for any reason, and since this point has been so generally misunderstood for so long by almost everybody involved in weight-training, I feel that it simply cannot be overstressed.

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Most weight-trainees sincerely believe that they are avoiding most of the danger of injury if they terminate a set prior to the point where the movements start to "feel" actually hard – they consider the last repetition the most dangerous repetition; but in fact, of course, quite the opposite is true – the farther you progress into a set, the safer it gets.

Regardless of the number of repetitions involved in a set, the first repetition is ALWAYS the most dangerous repetition – and the last repetition is ALWAYS the safest repetition; and the harder it seems, the easier it is – and the more dangerous it appears, the safer it is.

The last repetition of a set of ten repetitions, for example, "feels" harder only because you are becoming exhausted by that point in the set –you do not "feel" actual output, instead you "feel" the percentile of momentarily-possible output; if a man can press 200 pounds, then 100 pounds will "feel light" to him during a first repetition, and will "feel" heavier during each following repetition – and by the time he reaches a point where he is barely capable of performing one more repetition, then the 100 pounds will "feel" very heavy. Because – to him, AT THAT MOMENT – 100 pounds actually will be very heavy, since it will momentarily require 100 per cent of his strength to move it.

Everything is relative insofar as "feelings" are concerned – a puma looks big to a man that has never seen a lion; but the danger of injury is not based on relative factors in that sense – instead, the connective tissues have an actual level of resistance to pull, and since they are not performing work this resistance is not reduced during the performance of a set of several repetitions. If a particular tendon's connective tissues have an existing level of resistance capable of withstanding "one hundred units of pull," then that level of resistance remains constant throughout a set –it will be 100 units during the first repetition and 100 units during the tenth repetition; but the "danger factor" certainly does NOT remain constant – because, during a first repetition you might be momentarily capable of exerting 200 units of pull, and if you do then an injury literally MUST result, but by the time you reach the tenth repetition your momentary ability may be reduced to a maximum of only 10 units of pull, and you couldn't hurt yourself if you tried, you simply are not strong enough to hurt yourself at that point.

But – out of a totally misplaced and absolutely unjustified fear of injury – almost all weight-trainees avoid the actually most productive repetitions in all of their sets; they work right up to the point where one or two more repetitions would have done them some good – and then they stop because of fear of injury, thus avoiding the actually "easiest" repetitions, the actually "safest" repetitions, and the only repetitions in the set that would have produced much in the way of growth-stimulation.

Earlier, I said "almost all weight-trainees" are guilty of this mistake; but in fact, I have yet to meet a single weight-trainee who was aware of the actual facts in this situation prior to the moment that I pointed them out to them – and I have yet to meet very many trainees who really understood, or even accepted, the facts even AFTER they were carefully explained to them – and during more than thirty years of interest in this field, I never heard mention of these facts until I first pointed them out myself. Yet there is nothing at all "complicated" about the matter – the basic physical laws involved in this situation are so simple that they should be self-evident truth to any reasonably intelligent fifth-grader.

Until quite recently, I was under the impression that the "old timers" in weight-lifting were once aware of the real facts – or that they at least understood them in a practical sense; and I could never quite figure out why such simple things could have been so quickly forgotten. But now I have come to realize that even the trainees of the past really didn't understand what they were doing, or why they were doing it that way – instead, they merely practiced a style of training that was actually very productive without understanding "why" it was productive; they were doing the right things, but they were totally unaware of the real factors involved – they were literally training correctly "by accident".

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Thus, later, when the so-called "modern methods" of training were introduced, even the older trainees accepted them – apparently without question, and probably because they "seemed easier."

From all of the evidence, I can only reach the conclusion that nobody every really made a serious attempt to examine the actual facts of the matter –or if so, that the people who tried to do so were simply unaware of basic physics and simple math. In no other manner can I even begin to explain the fact that most of the sincere beliefs of almost all weight-trainees literally attempt to ignore the laws of physics. But I will remind you that an unawareness of the law of gravity – or a refusal to admit the existence of gravity – will not change the facts; and you will hit the sidewalk with exactly the same speed as the next guy if you make the mistake of stepping off a tall building – and with much the same results.

So – since it is obviously required – in the next few chapters I will attempt to cover the actually very simple points of basic physics that are involved in exercise; and because of the very real importance of these physical laws, I hope I can be excused for using an extremely simple method of explanation.

But in the meantime, we should add the following points to our list of basic points . . .

27. The first repetition is actually the hardest repetition – in spite of appearances to the contrary.
28. The first repetition is by far the most dangerous repetition.
29. Momentarily maximum-possible power should be produced in each set of every exercise – but NOT during the first three or four repetitions.
30. "Stopping short" of the point of failure will not reduce the danger of injury – but it will enormously reduce growth stimulation.
31. Workouts are for the purpose of "building size-strength," not for the purpose of demonstrating strength.
32. Supporting heavy weights – but NOT moving them – will increase the strength of connective tissue; and will do so without much danger of injury.
33. Sudden movements against resistance are the most dangerous types of movements – and the actual amount of the resistance is of little or no importance.
34. "Jerky" movements should be avoided at all costs.
35. You cannot judge the intensity of an exercise by the "feel" – except in relative terms; but you can judge the value of a movement by the "feel" – because relative intensity is the only factor of any real concern insofar as inducing growth-stimulation is concerned.