

# Nautilus Bulletin #2

# 20

## Direct Exercise

Most exercises are "direct" in no sense of the word – and many exercises are direct only at one point during a movement that extends over a wide range-of-movement; a squat is not direct at any point during the movement – a curl is direct at only one point during the movement, an infinitely small point, the so-called "sticking point."

In order to be "direct" in the above sense of the term, the resistance provided by an exercise must be directly opposed to the movement, 180 degrees out-of-phase with the movement – if it is direct in this sense, then an inch of movement of the involved body-part produces an inch of movement of the resistance; in effect, any movement of the body-part produces an equal movement of the resistance – and if the resistance is provided by gravity, this means that body-part movement must produce an equal degree of "vertical movement" of the resistance.

The reaction of the average bodybuilder to the above paragraphs will undoubtedly be, "So what?" But if so, then an extremely important factor is being misunderstood or overlooked; the lack of directness of resistance application is one of the major shortcomings encountered in barbell exercises. In the case of a barbell curl, this lack of direct resistance results in a situation where you encounter literally NO RESISTANCE during a fairly large part of the movement – and this occurs in the most important part of the movement, at that.

But the above covers only one of two distinct meanings of the term "direct" as it applies to exercise; to be direct in the other sense, the resistance must be applied against the "prime body-part", against the body-part that is directly moved by the involved muscle. For example; in a curl, the involved muscles are attached to, and directly move, the forearms; thus, in a curl, the resistance must be applied against the forearms. Which, for all practical purposes, is the actual practice in the curl – since the hands are effectively an extension of the forearms.

To be perfectly technical about it, for totally direct resistance in a curl, wrist joints would have to be fused – in order to prevent any possible movement between the hands and forearms; but in practice, because of the limited range of possible movements of the wrists, and because of the positioning of the related arc of this movement, no significant reduction of the effective degree of directness of resistance application is produced by wrist movement. So – for all practical purposes, at least – a curl is a direct exercise in this sense of the word. While the squat is not.

An example of a "perfectly direct" exercise – in both senses of the term – is the movement performed on a thigh-extension machine; in this exercise, the resistance is always directly opposed to the possible direction of movement, and is applied directly against the prime body part. Or at least it is in some machines; and, rather paradoxically, the least-expensive thigh-extension machines are generally the best ones. In the Universal (brand name) thigh extension machine, the resistance is provided by a vertical-rise weight-stack that is driven by a cable – which cable, after passing over redirectional-pulleys, is attached to the movement-bar of the machine; which makes it very convenient – but which also goes a long way in the direction of ruining the function of the machine. Because the resulting geometry is such that the resistance is highest at the start of the movement, and then decreases as the movement progresses. It is undoubtedly possible to design a machine in such a manner that it would be WORSE; but you would be required to think about it first.

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In the Universal thigh-extension machine that we have been using for more than a year in experimental weight-training programs in Florida, the primary source of resistance is limited to 150 pounds – but since that isn't enough for many of our trainees, we have been adding additional resistance in the form of barbell plates, adding them to a rod incorporated into the machine for that purpose; the somewhat amusing part of the situation is the fact that the "added resistance" is far superior to the primary resistance –since the geometry of resistance in this case is at least not backwards, if perhaps not perfect.

Quite recently, one of our trainees exerted such force against the moment-arm that one of the redirectional-pulley brackets was torn entirely loose from the machine – thus rendering the primary resistance inoperative; so we didn't use the machine for a few days, intending to repair it when we got around to doing so – but then it occurred to me that such a break-down was actually an improvement in the machine, so now we don't intend to ever repair it. because by using only resistance provided by the secondary resistance source – barbell plates added to a rod on the moment arm – we have a much improved-exercise.

Much less-expensive types of thigh-extension machines, which have only cross-bars for holding barbell plates, are actually far more productive –because the "resistance curve," while certainly not perfect, is at least not backwards.

I do not know if the people who design most machines are simply unaware of the desirable characteristics and actual requirements of exercise – or if they don't care, perhaps being interested only in appearance and convenience; but the results of such incorrect design are the same in either case – the geometry of the machines is not what it should be, and could be, and it thus becomes literally impossible to produce really worthwhile results from the use of such machines, results in proportion to the training-time and effort expended.

Most barbell exercises provide no direct resistance, some barbell exercises provide direct resistance only during a small part of the movement – but a few barbell exercises provide fairly-direct resistance over a wide arc of movement; the barbell wrist-curl – if performed in the proper manner – is almost literally a "perfect" exercise, since it provides full-range directness of resistance and even automatically varying resistance which comes very close to being exactly "right".

To begin with, the resistance in a wrist-curl is applied directly to the prime body-part (the hands) – secondly, the arc of movement is such that the resistance increases throughout the movement, and if the angle of the forearms is proper then the resistance reaches its highest point just as the involved muscles reach their strongest position – thirdly, the geometry of the involved joints and muscular attachments is such that the strength curve increases throughout the movement, steadily (if not quite evenly) increasing as the muscles move from a position of full extension to one of full contraction.

If a trainee can be taught to perform this exercise properly – and if he will then practice it properly – nothing but a barbell is required for producing results that are so close to being maximum-possible results that no slightest difference is of any significance; secondly, while it would at least be "possible" to design and build a machine that would provide better exercise for the involved muscles, the degree of improvement would not be justified.

And an almost exactly parallel situation exists in regard to the calf muscles; which is paradoxical – and amusing – because the forearms and the calves are by far the easiest parts of the body to develop, and because the required exercises have been in existence for many years, and because these exercises can be properly performed with absolutely nothing in the way of special equipment – and yet, most bodybuilders are firmly convinced that the calves and forearms are the "hardest" body-parts to develop.

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I have consistently refused to waste my time and energy designing and building a calf-machine – because no such machine is needed; but we will eventually offer forearm-machines – even though they will almost-exactly duplicate barbell exercises, and in spite of the fact that they will offer absolutely nothing in the way of actual "improvement" by comparison to barbell exercises. These machines apparently are a necessity, because it seems to be almost impossible to teach most trainees the proper style of performance using a barbell; and it seems to be utterly impossible to get trainees to use the proper style even when they do understand it. So a machine that forces the trainee to use the proper style does seem to be a requirement in this instance.

It might be a source of interest to some readers to mention the fact that the entire Nautilus method and system of training was a result of a search for "direct exercises" – at the start, we were looking for a method that would provide direct exercise for the latissimus muscles of the back, since it was obvious that all conventional exercises for those muscles left a great deal to be desired. "Pullups" (or "chins"), pulldowns, behind-the-neck chins, rowing exercises of a wide variety, and all other conventional exercises for the latissimus muscles certainly do provide "some" work for those muscles; but they all have one fault in common – they all involve the muscles of the arms as well as the muscles of the back that you are trying to work.

The latissimus muscles are attached to, and move, the upper arms – thus, for direct exercise, the resistance must be applied against the upper arms; what happens to the forearms, and-or the muscles of the upper arms that move the forearms, is of no slightest importance – or would not be of any importance in a direct exercise for the latissimus muscles.

You hang a man by suspending his weight from his head – thus imposing the resistance on his neck; if you tried hanging him by his hair, the hair might pull out before any results were produced in regard to the neck. A very similar situation exists in conventional exercises for the latissimus muscles; instead of applying the resistance directly against the prime body-parts (the upper arms), such exercises apply resistance against the forearms – thus creating a "weak link" in the form of the proportionate lack-of-strength of the muscles in the upper arms. You fail in such an exercise when your arms reach a point of failure – not when the latissimus muscles become exhausted.

So you are constantly limited in such exercises by the limits of existing strength of the upper arms – which, being smaller and weaker than the latissimus muscles, fail long before the much larger latissimus muscles have been worked hard enough to induce much in the way of growth stimulation.

All of which is obvious, and all of which we were clearly aware of nearly thirty years ago – and vaguely aware of more than thirty years ago; since then, we have gone through many intermediate steps in our attempts to provide direct exercises for the latissimus muscles – and while we make no claim that our present machines are literally "perfect," they are, at least, so close to being perfect that no significant shortcomings remain. Additionally, we are clearly aware of the actual shortcomings that do exist – and also aware that they are the results of unavoidable compromises imposed upon us by unchangeable mechanical limitations and-or physical laws. In effect, our machines are as perfect as they can be – as they ever will be; in function, at least.

But we certainly did not reach the presently-existing state of development in one jump; which is why, I think, that some people do not understand the actual principles involved – or think that "just any" similar-appearing machine will produce similar results – or feel that the machines should be used in a fashion similar to the style of training usually employed with a barbell.

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Automobiles would be far safer and more efficient if they didn't have doors and windows – and less-expensive, too; but in practice, you must be able to enter and exit an automobile, so you must have at least one door – and for any sort of practical function, an automobile must provide some view of the outside, so you must have at least one window. In order to use one of our Pullover-type Torso Machines, you must be able to get into it – with your elbows in the proper position; so we had to provide a means of entry (and exit), and in so doing we reduced the efficiency of the machine slightly –but a "not quite perfect" machine that can be used is certainly better than a perfect machine that can't be used.

Some of our earlier machines were actually "better" – or, at least, more efficient (very, very SLIGHTLY more-efficient) but they were literally "three-man machines," it took the help of two other people to get you into (or out of) these machines. So we compromised – as we were forced to; but at least we were clearly aware of what we were doing, and why we were doing it, and also knew what the results would be – and since it is my personal inclination to work for absolute perfection, I have now designed and built more than forty different models of the Pullover-type machine in efforts to get the function as close to being perfect as it can be in practical application.

Which might explain why I was so irritated when a man on the west coast altered one of my machines in a stupid attempt to improve its convenience and safety; which action was fully on a par with a remark a primitive African made to me immediately after I had given him a ride in a helicopter – I asked him if he thought he could fly the helicopter, and he said, ". . . oh, yes; I saw what you did, you turned that switch (meaning the ignition switch), and then you held onto that stick. I can do that, too." But the African, at least, was innocent in his ignorance – he wasn't arrogant enough to think that he could improve something that he didn't understand. He didn't remove the engine and rotor from the helicopter – replace them with a tree – and then complain it wouldn't fly.

Having spent more than twenty years of his life almost desperately searching for direct and "actually proper" exercise, this man on the west coast not only remained totally unaware of what he was really seeking but promptly ruined it when it was provided.

With a barbell, direct exercise CANNOT be provided if rotation occurs around more than one axis – and it will not be provided even in single axis exercises unless the position of the involved body-parts is correct; and even then, usually only at a certain point during the movement.