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Muscular Function

Human muscular structures – at least the type of muscular structures we are primarily concerned with here, which might be defined as the "visible muscles" by bodybuilders or the "useful muscles" by weight-lifters – perform work by contracting, by reducing their length, and thus exerting a pulling force on the body parts to which they are attached. While the body is fully capable of performing a number of "pushing" movements with great force, the actual power for all movements is provided by muscles which "pull."

Since a significant degree of reciprocal movement ("in and out" movement, or "up and down" movement like that of a piston in the cylinder of an engine) is impossible for human body parts, almost all such movements are rotational in nature – but this rotary movement of body parts is powered by reciprocal function of muscular structures.

Unavoidably then, the ratio of efficiency of bodily movements is not constant; at the start of a movement such as a barbell curl, the involved muscles are exerting force almost straight "up," approximately in line with the center-line of the muscles providing the power (primarily the biceps) –but the body part which is moved by this force, the forearms, cannot move "up," they can only move "forward" by rotating around the axis of the elbow. Thus a large part of the force being exerted by the biceps is wasted, since the angle-of-pull is such that the efficiency ratio is very low at that point in the movement; in effect, that is the "weakest" point in the movement – paradoxically, however, it may well appear to be the strongest point in the movement, because (as in a barbell curl) there is literally no resistance at the start of the movement in most conventional exercises.

As the rotational movement of the forearms proceeds during the performance of a curl, the ratio of efficiency rapidly improves – up to a point, the so-called "sticking point" at which point the ratio of efficiency is at its best; but again, appearances are opposite to the facts – because, at that point in the movement, the moment-arm of the resistance is at its highest point and the "effective resistance" or torque is at its highest point, and thus the weight will feel heaviest at that point in the movement and the muscles will seem weakest.

In fact, that point in the movement is NOT the position of maximum strength – but it is the point of best efficiency; the position of maximum muscular strength is reached at the finish of the movement, in the position of full contraction – at that point, and only at that point, it is possible to involve all of a muscular structure in the work. It should be clearly understood that the ratio of efficiency has little or nothing to do with "measurable efficiency" – not, at least, if attempts are made to measure it on the basis of the ability to perform standard strength tests. The ratio of efficiency is based strictly upon a comparison of the amount of power being produced by the muscles and the amount of power reaching the involved body-parts; at the start of a curl, for example, very little of the power from the muscles is useful for any measurable purpose – but at the sticking-point in a curl, a very high percentage of the power is useful. After the movement has passed the sticking point in a curl, then the ratio of efficiency starts to decline again – although, in a curl at least, it will never return to the low point of efficiency that was experienced at the start of the movement.

Thus in a conventional curl, it seems that you are getting weaker as a curl moves from the starting point to the sticking point – when in fact you are getting stronger; and it seems you are getting stronger after you pass the sticking point – when in fact you are getting weaker. Or, at least, the efficiency ratio is improving when it appears to be declining – and vice versa. But all of these false impressions are due to the fact that the resistance in a conventional curl is reciprocal in nature – and thus not constant throughout the movement.

But even that isn't the full story; because, in addition to the constantly changing efficiency ratio involved, you also have the factor of constantly changing muscular strength. At the start of a curl, the muscles are extended – and in the extended position a muscle can produce only part of its actual power. In order to produce power in proportion to its existing potential, a muscle must be in the position of full contraction. Thus the "input of strength is constantly rising as a muscle moves from a position of full extension to one of full contraction; in effect, in a curl, the muscles provide constantly increasing amounts of power for the movement as you move from the straight-arm position to the bent-arm position. Although it will not appear that this is happening – for the reasons mentioned above.

When all of the factors are taken together, and when the curling muscles are exposed to rotary-form "direct" resistance so that it becomes possible to judge on the basis of actualities rather than appearances, it is immediately obvious that the usable strength for curling is at its lowest point at the start of the movement, increases to – and past – the sticking point, and then gradually falls off near the end of the movement. Up to the sticking point, all factors are contributing towards an increase in usable strength – the ratio of efficiency is improving and the power input is increasing at the same time; beyond the sticking point, the ratio of efficiency starts to drop off again, but the input of strength from the muscles continues to increase – and the net result is an overall increase in usable strength, up to a point. But beyond a certain point, the drop in efficiency is no longer fully – or more than fully, as is the case in some areas of the movement –compensated for by the increase in input of power from the muscles; and beyond that point, a drop in usable strength must occur.

Such interrelationships are actually quite simple in the case of a movement such as the curl, where movement is confined to rotary movement around one axis (the elbow axis), and where the angle-of-pull factors are easy to visualize and understand; but in some cases the situation is far from being simple or easy to understand – although the factors are known and have been carefully considered and allowed for, it is not an easy task to try to describe them to a person without the required background in physics and physiology.

For example, in a standing press with a barbell the movement is rotational around several axis points – and the angle-of-pull factors are also far more complex; likewise, the changing moment-arm factors in this movement are not as simple as they are in a curl, so it is not so easy to calculate effective resistance, or torque.

Nor is it enough to simply design an exercise – or an exercise machine –that "feels right," that apparently has no sticking points or points of little or no resistance; the very fact that such an exercise did feel right to the average person, or almost ANY person, would in most cases be solid proof that it was "wrong." Muscles cannot develop properly unless they are exposed to proper resistance – which is impossible with conventional exercises; thus actually proper resistance will almost always "feel wrong" at first contact. Our new curling machines "feel" almost perfectly even to me – that is, no point in the movement feels any heavier than any other point, the weight seems to be the same in all positions; while in fact it is constantly changing throughout the movement. Yet to a man with actually much larger arms – a man that has previously trained with conventional equipment – the machine feels decidedly "wrong" when it is first tried; many such individuals have been literally shocked to realize that they could not pass the mid-range of the movement with an actually very light weight – a weight that much smaller men who have used the machine for a while can handle easily in any position.

But the above must not be misconstrued to mean that the machines build "smaller" arms – on the contrary, the machines build larger arms; the potentially largest and strongest part of a muscle is the center of the muscle – the center as determined by its position between the two ends of the muscle – and in conventional exercises this part of the muscle is seldom if ever involved in the work at all. As a result, most people – and this is even more true of men who have trained in a conventional manner than it is of men that have never trained at all – have very little strength or muscular size in the areas that should be largest and strongest; never having trained that part of their muscles – the major part, the potentially largest and strongest part – they have almost no strength or size in those areas. At this point in time, we still don't know just what a fully developed muscular structure will even look like – but it is at least likely that the overall "shape" of fully-developed bodybuilders will be quite different from the shape that is seen today. To some degree, Casey Viator is already an example of "things to come" – standing relaxed, he looks much like many other bodybuilders, but when he flexes his muscles "things happen," things that don't happen when other bodybuilders flex their muscles, he seems to "grow" right before your eyes.

A year ago, a former Mr. America told me very heatedly that Casey could not possibly get any larger without becoming fat – but he did get larger, much larger, and he actually improved his degree of muscularity at the same time, and he did so while maintaining an overall symmetrical appearance; when Bill Pearl won the Mr. America contest it was noted that he did not win any of the "best body parts" awards, and it was mentioned that his failure to win these sub-divisions of the contest was proof of his symmetrical development, that no one body part "stood out" in such a fashion that it appeared outstandingly developed – yet Casey Viator won all of the body-parts awards except best abdominals, and he easily could have won that subdivision as well since his abdominal area is on a par with that of anybody living or dead.

Casey probably failed to win the award for best abdominals simply because that area of the body is never as obvious in a really bulky physique as it is in the case of a much thinner man: the average viewer – even the average judge of a physique contest – is so impressed by the rest of the physique that he simply overlooks the abdominal area, unless it is obviously poorly developed. But if the rest of the body is properly developed, then it is literally impossible for the abdominal area to be really poor; Casey's abdominals are outstanding – yet he has done absolutely no direct work for that area of his body in more than a year – if you train the rest of the body properly, then the abdominal area will take care of itself. The billions of situps and leg-raises that have been performed by millions of trainees have been almost a complete waste of time and effort; if you have fat "anywhere" on the body, then you will have "more fat" in the abdominal area – and if you have "any" fat in the abdominal area, then you will have "some" fat everywhere. You can get rid of all visible fat only by regulating the input of food in relation to the output of energy.

Our efforts have been primarily directed towards attempts to determine the exact functions of muscles – so that exercises could be provided in a logical manner, in a manner suitable to the functions of muscles rather than barbells. Later chapters devoted to particular exercises will help to make the real functions of most of the major muscular structures clear to the average reader; and while you might not care "why" a muscle functions as it does, it should at least be obvious that you must know "how" it functions in order to know how to provide proper exercise.