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Cam Action

The strength of a muscle depends upon its position – muscles are weakest in their extended positions, and strongest in their fully contracted position; a muscle works by shortening, exerting a pulling force as it contracts –and its strength level increases as it changes position from an extended to a contracted position.

Yet almost all forms of exercise totally ignore this basic characteristic of muscles – and one result is that muscles are overworked in some positions while not being worked enough in other positions; in most cases, the muscle is prevented from working anywhere close to its true strength level –because the resistance employed, if light enough to start a movement with, is far too light to properly work the muscle in its strongest, fully contracted position.

Obvious results are produced by exercise in spite of this shortcoming, but this is merely another proof of the potentially enormous benefits that such exercise is capable of producing; and if this limitation is removed, then even better results can be produced – far better results.

If a man is capable of starting up from the bottom position in a full squat with 300 pounds of resistance added to his own bodyweight, then he can probably do a very "limited range" partial squat with at least 1,000 pounds – yet a thousand pounds would literally crush him helplessly to the floor if he made the mistake of bending his legs more than a few degrees under such a load.

The correct answer to that problem is quite simple – after the fact; but it required many years of research to produce any sort of an answer. An answer that is only now being placed into common practice. The resistance must vary throughout the movement, changing in proportion to the strength of the involved muscles in various positions.

Quite simple – after you have heard it; but so is a wheel – after you have seen one, and yet it took several thousand years of need before something as simple as a wheel was even thought of.

The varying strength of a muscle, however, is not entirely determined by its position –although that is an important consideration; an even more important factor is one I have named "cam action". Muscles work by moving in approximately straight lines, and almost all forms of resistance also impose their forces in approximately straight lines, but muscles cause movement by acting upon body parts that move in a semi-circular fashion. Thus, in order to raise a weight in a straight line, the involved body parts must be rotated – the only other possible method of raising a weight, and in this case it won't rise in a straight line, is by rotating the weight itself. In all cases, "something" must rotate – either the weight or the involved body parts; and in practice, this rotation is usually shared – the body parts rotate to some degree, and the weight rotates to some degree.

Thus, in practice, we encounter so-called "sticking points" in most exercises – a point in the movement where the resistance seems much heavier than it does at other points; and we also encounter points of little or no resistance – where the weight seems to weigh almost nothing.

Parts of these areas of seemingly varying resistance can be attributed to the variations in a muscle's strength in different positions, but cam action is responsible for a large share of these effects.

Fortunately, this problem has been solved – completely. Exercises now exist that are capable of working all of the major muscles of the body in an exactly rotary fashion.

But solving this problem led to another problem; once it became possible to eliminate cam action, then the effects produced by the variations in muscular strength in different positions still remained – removing cam action greatly improved the situation, but a perfect form of exercise had still not been achieved.

Doing away with cam action produced exercise movements that were actually perfectly smooth – the resistance was exactly the same in all possible positions; but it still didn't "feel" even – it felt too heavy at the start of a movement, and too light at the end of a movement.

But now this problem has been solved as well – completely solved; the actual resistance must vary throughout the movement – in exact proportion to the changing strength of the involved muscles. When this is done properly, the movement "feels" perfectly smooth – there are no sticking points, and no areas of light resistance.