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# The Future of Exercise... an Opinion

Now that the medical profession has finally, if belatedly, recognized at least part of the potentially great value of exercise, it behooves everybody to approach the subject on a logical basis; if not, then the doctors now becoming interested in sports medicine will be forced to learn the hard way, by repeating many of the mistakes the others have already made.

An enormous quantity of literature exists on the subject of exercise, for those who have time to read it... but if so, where do you start, who do you believe, what do you believe? The presently existing controversy is that we might well be far better off with absolutely nothing in the way of literature on the subject of exercise; then perhaps the whole issue could be approached on rational grounds.

Millions of people have already devoted literally billions of hours to trial and error experimentation, so experience is certainly not one of the factors that is lacking... but in fact, very little of any value seems to have been gained by all that experience. On the contrary, myths and superstitions still abound; while the simple fact remains largely ignored, frequently even unsuspected.

And what are the facts? The point of primary importance is the simple fact that functional ability is improved by proper exercise. But, then, just what is proper exercise? Logically, proper exercise can only be defined as the minimum amount of exercise that will produce the desired result. Anything in excess of that minimum is by definition unnecessary, therefore illogical... and possibly contra-productive.

Probably the most damaging misconception in the field of exercise is the widespread, almost universal tendency to equate quantity with quality; which is a seemingly natural tendency, and therefore understandable... but which runs squarely in the face of the facts. Which utterly ignores the unavoidable interrelationship of intensity of work and amount of work.

An actually very small amount of proper exercise will produce surprisingly good results if the intensity of work is correct; and no amount of exercise will produce any worth-while result if the intensity of work is wrong.

There is an obvious but unmeasurable threshold of intensity... below which no amount of exercise will stimulate the improvement of functional ability. But just how do we define intensity of work? And how can we ever be sure that an unknown, even unmeasurable, level has been reached?

Intensity of work is a relative factor having absolutely no relationship to the amount of work; it can be best defined, I think, as the percentage of momentary ability. In which case it can be measured accurately at only two possible levels, 100 per cent and zero... when you are working as hard as momentarily possible, or when you are doing absolutely nothing.

A very brief experiment is all that is required to prove that a zero level of intensity will quickly produce both muscular atrophy and a loss in cardiovascular ability; so a level of work somewhat above zero is obviously called for.

An even briefer experiment will also prove that you cannot work at a level of 100 percent for more than a few seconds. The unavoidable conclusion being that we must work somewhere between the only levels of intensity that are measurable. But where, at what level? For how long? How often?

Those being the questions that have produced the currently wide-spread controversy in the field of exercise. Practical answers to which questions already exist; even if, as happens to be the case, the answers still remain largely unknown, or even denied.

Unknown by whom? By the vast majority of doctors now beginning to become interested in sports medicine. Denied by whom? By a wide array of conflicting commercial interests, and even by more of the supported experts in the field of exercise, the research scientists.

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The future of exercise depends upon the resolution of the questions now being so hotly debated; until and unless something approaching a general consensus is reached, the existing confusion will simply be compounded.

Additional research may or may not be the answer; but if the existing literature resulting from previous research in the field offers any reasonable criteria for judgement, then I think we can look forward to at least another century of confusion, missed opportunities, and largely wasted effort.

Or it may even turn out worse; the present confusion could easily lead the medical profession as a whole into an almost outright rejection of exercise. And if so, once having rejected it, many centuries could pass before exercise was even afforded the courtesy of another look. In which case the loss to everybody would be enormous.

While future improvements in existing equipment are almost certain, the primary problem exists elsewhere; very good results can be produced by proper use of a wide variety of exercise equipment that is already available... the real problem, as I see it, is getting people to utilize the equipment properly.

The mere existence of equipment that is capable of producing good results is apparently not enough; in an ideal world it might be, but in the real world it isn't... most people seemingly need equipment that literally cannot be used in any manner except a proper manner. If it can be misused, it usually will be misused.

Enter the computer. And with the aid of a computer, this is the way I see the future of exercise. Five years into the future? Ten years? I don't know, but coming; perhaps for no better reason than the fact that it is now possible, and anything that can happen probably will happen. Or maybe it will happen out of sheer economic necessity; since truly widespread utilization of proper exercise is not economically feasible under currently existing circumstances... proper supervision of exercise being prohibitively expensive already and steadily increasing, such supervision much come from a non-human source, from a machine, a computer. And it will.

Enter the gym of the future, pull your pre-programmed plastic card out of the file and insert it into a slot in the machine... and from that moment on, the machine will tell you exactly what to do, how to do it, how hard to do it, and how often to do it. And keep an accurate permanent record of what you actually do.

As soon as your card is inserted, your number will appear on the first of several exercise machines. Which machines will be instantly and automatically set for you; with careful consideration for all of your individual requirements, your existing strength level, your degree of flexibility, your cardiovascular ability, your age, your previous medical history, and any other important considerations.

The level of resistance? Whatever you require, at that point in time; but the machine itself will actually provide no resistance at all. You will be the source of your own resistance; providing resistance for the concentric exercise of one limb by eccentric exercise of the bilateral limb... the result being an almost silent form of exercise with many advantages over conventional forms of exercise providing external sources of resistance, weights or friction.

In effect, using a leg-press exercise as an example, your right leg would provide the resistance required to work your left leg, and vice versa. Upon seating yourself in the leg-press machine, you would find the two separate foot pads located precisely at the mid-range of possible movement; which makes it very easy to enter the machine, since you are not required to wedge yourself into position against the force of resistance pushing a common foot pad back into the stretched starting position encountered in conventional leg-press machines. So entry is quick, easy, and safe... a consideration of no small importance.

To start the exercise, it is merely necessary to press against one of the foot pads, thereby straightening that leg; whereupon, as one leg straightens, the opposite foot pad will be forced back towards you and your other leg will be required to bend.

Kindly note; I did not say that your other leg would be forced to bend... instead, I said it would be required to bend. The difference being significant.

The leg that is being straightened will be working concentrically, will be performing positive work... while the leg that is bending will be working eccentrically, performing negative work. And, in the realm of muscular work at least,

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negative is far stronger than positive; the result being that you would find it simply impossible to force one leg to bend by the use of straightening force available in the other leg. Not unless a gross imbalance in bilateral strength existed.

So the positive-working limb cannot force the negative-working limb to do anything. Instead, the negative-working limb must permit movement of the positive-working limb. The result being that you are literally provided with an infinite source of resistance; as much as you can handle while working at a 100 percent level of intensity and more... or as little as you want. Or anything in between.

Disregarding a slight and unimportant amount of unavoidable mechanical friction, the level of force will be exactly equal in both the negative and positive parts of the work; if your right leg is pushing with a force of 200 pounds, then an exactly equal level of force will be pushing back against your left leg.

In such a machine, it is easily possible to make every positive movement a maximum-possible effort involving an intensity of work of 100 per cent... but in practice, doing so is neither necessary nor desirable. Instead, the first several repetitions should be performed at an intensity well below 100 per cent... for several reasons; to greatly reduce the chances of injury, to gradually warm-up and lubricate muscles and moving joints, and to pre-exhaust the muscles so that one or two repetitions very near an intensity of 100 per cent can be performed at the end of the exercise while keeping the actual force at a relatively low level.

And just how do we know how hard to push? The machine will tell us; if we push too hard, the machine will tell us, instantly... if we don't push hard enough, the machine will tell us. If we push exactly as hard as we should, then the actual amount of force produced by one leg and imposed on the other leg will remain constant throughout most of the exercise; and when it becomes momentarily impossible to produce that level of force, then it is time to stop.

But while the actual force would remain constant in such an exercise, the level of intensity would increase from repetition to repetition; until, at the end of a properly performed set of twelve repetitions the muscles would be working at a level of intensity of 100 per cent.

And don't now jump to a hasty conclusion; instead of being somewhat different in that regard from conventional exercises, a moment of consideration will make it obvious that exactly the same thing happens in all conventional exercises if more than one repetition is performed. Only one repetition of 100 per cent intensity is possible in any conventional exercise, regardless of the number of repetitions performed. Because, if the first repetition is of 100 per cent intensity, then it will also be the last, the only one possible. It is possible to stop an exercise well short of intensity of 100 per cent... but it is utterly impossible to continue an exercise after the performance of one repetition of 100 per cent intensity.

The resistance involved in the exercises of the future gym I am discussing will not be isokinetics in nature; instead, such a form of bi-lateral, self-engineered resistance is called infimetric. Just as with an isokinetic form of resistance, it is easily possible to perform several repetitions of 100 per cent intensity while using infimetric exercises; but I repeat, doing so is neither necessary nor desirable.

The ten basic requirements for a truly full-range exercise are as follows: 1) direct resistance, 2) rotary form resistance, 3) automatically variable resistance, 4) balanced resistance, 5) positive work, 6) negative work, 7) stretching, 8) pre-stretching, 9) unlimited speed of movement, 10) resistance in a position of full muscular contraction. All of which requirements will be provided in most of the exercise machines used in the gym of the future.

### Training Procedure

Seated in the first exercise machine; press out the right leg, smoothly and fairly slowly... the left leg is simultaneously pushed into a bent position of muscular stretch. Pause, stretch a bit more, and then, taking advantage of the pre-stretch reflex, immediately press out with the left leg while the previously straight right leg starts to bend. Continue for a total of approximately ten positive repetitions for each leg, while never changing the input of force; then, having momentarily reduced your starting strength level by the earlier submaximal repetitions, perform two more positive repetitions for each leg... making each of these last four positive movements a maximum effort, utilizing 100 per cent intensity.

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Danger? Little if any; almost none insofar as danger of pulling a muscle or its connective tissue is concerned... because, by the end of the exercise, you literally aren't strong enough to hurt yourself if you maintain anything even approaching good form. Regardless of the fact that the momentary intensity is then 100 per cent... it nevertheless is also true that the level of force remains relatively low throughout the exercise, and is actually at its lowest point during the final four movements. High-intensity but low-force exercise... productive and safe.

Such exercises already exist... the only thing really lacking in order to build the gym of the future right now is linking a variety of these machines to a computer; but computers also exist... so the marriage will occur, is already occurring.

The machines of the future gym won't make you exercise properly, nothing can do that... nobody can do that. All that anybody or anything can do is make it possible for you to exercise properly, and then encourage you to exercise properly, tell you when you are doing something right, and when you are doing something wrong; and the machine can do all of those things, and do them far better than any human supervisor.

Additionally, the machine can do many things that no human can like keeping an instant and exact record of your workouts when they need changing. Sensing and reacting to any reasonable number of physiological factors, pulse, blood pressure, and other factors.

And what will such a facility cost? In hard figures, that remains an impossible question at the moment; but in a practical sense, the price will undoubtedly be far lower than the present cost of properly supervised exercise. If for no other reason than the simple fact that one supervisor could easily and simultaneously supervise the workouts of several hundred individuals.

And what will be the results of such exercise? Any kind and degree of results that can now be produced by any type of exercise... increased strength... increased flexibility... increased cardiovascular ability... rehabilitation of a wide variety of injuries... rehabilitation following certain types of illness... or a program designed merely to maintain a previously built level of strength, flexibility or cardiovascular ability.

The machines can be computer programmed for any purpose; but perhaps of greatest importance, a machine won't lose interest in the subjects working under its supervision.

The most difficult, and certainly the most widespread problem at the present state of the art seems to be the one of motivation; in a practical sense, it is difficult to get people to perform their exercises properly. If both the form and intensity of work are proper, then exercise is capable of producing surprising results in a short span of time; but there seems to be a natural tendency on the part of most people to permit a rapid deterioration in the style of performance, or form... as well as a tendency to gradually reduce the intensity of exercise without even being aware that such is occurring.

Both problems, poor form and lowered intensity, results from a desire to show progress; thus, under the mistaken impression that they are thereby improving at a faster rate, most people quickly start changing the form or intensity of their exercises... and are encouraged in this direction by the fact that doing so increases the amount of resistance they can handle, makes it possible for them to lift more weight. Or, in fact, makes it possible for them to throw more weight; because, by that point, they are no stronger lifting the weight; instead, they are throwing the weight.

No increase in resistance is meaningful unless the form remains unchanged, and no amount of exercise will produce good results if the form is not good. But just what is good form in exercise?

The answer to that question depends upon the purpose of the exercise; developing muscular strength requires certain factors that are not necessary if you are interested only in increasing cardiovascular ability... although, in fact, properly performed strength exercises unavoidably will increase cardiovascular ability as well as strength.

During a large-scale research program that we conducted in cooperation with the physical education department of the United States Military Academy at West Point, during April and May of 1975, it was clearly demonstrated that properly performed strength exercises in fact do have very meaningful effects upon cardiovascular ability.

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For example, in one such test of cardiovascular effects, the two mile run, our Wholebody Group of 19 subjects reduced their time by an average of 88 seconds as a result of only six weeks of strength training. While a control group of 15 subjects reduced their average time in the two mile run by an average of only 20 seconds during the same six-week period.

Both groups were composed of varsity football players, and both groups were involved in spring football practice during the period of the experiment; so the improvement shown by the control group must also be attributed to spring football practice; but the remaining improvement of 68 seconds was a direct result of the strength training.

Similar results were produced in each of more than sixty other tests of functional ability, strength, flexibility, speed, jumping, and a complex battery of cardiovascular stress testing.

While it is certainly possible to improve strength while doing little or nothing to improve cardiovascular ability, it is neither necessary nor desirable to do so; which point was clearly and decisively demonstrated by the West Point Study.

During the same study, the Wholebody Group of subjects increased their neck strength an average of 91.92 per cent... in a period of twelve very brief workouts. While a matched control group improved its neck strength an average of only 27.84 per cent as a result of training that formed part of spring football practice during the same span of six weeks.

So the form, or style of performance, of proper exercise depends upon the purpose of the training; although, in fact, certain basic rules should be applied to any exercise performed for any purpose.

But the gym of the future will provide for the utilization of any worth-while style of performance, for any purpose... and, of far greater importance, it will prevent certain dangerous styles of performance; while it may not literally force you to train right, it will prevent you from using many of the dangerous and non-productive styles of training that are so common today. And, if you don't train right, you and your supervisor will both be clearly aware of it... instantly.

By the time this article appears in print, a long-range research program utilizing several hundred subjects will already be underway... using the first prototypes of the equipment required for the gym of the future; within a year after this article appears, we hope to have the results of this study ready for publication. By which time, we should also know what changes, if any, are required in the way of either equipment or the use of equipment.

But, on the basis of preliminary testing that has already been performed, I can now state that the results will be very good in every area, strength increases, flexibility increases, and cardiovascular improvement... and that the amount of training time required to produce large-scale improvements in all of these areas of functional ability will be less than 90 minutes weekly.