

Exercise... '86: The Present State of the Art

Arthur Jones

For the last century, exercise has been an art... it has now become a science.

Meaningful exercise was first introduced in this country about a hundred years ago, having started a few years earlier in Europe. But the potential benefits of exercise were overlooked by most people, and totally ignored by the scientific and medical communities, for nearly sixty years.

Some interest in exercise was aroused during the Second World War, when the poor physical condition of most military recruits created problems that simply could not be ignored... but even in the face of an obvious problem, little or nothing of any actual value was suggested or tried in the way of a meaningful program of exercise. I know, because I was there.

During the Second World War, a few people in the military, very few, something less than one percent, exercised where and when they could, generally by lifting weights. When and if they could find the required equipment, a barbell. An even smaller number of people exercised by running.

Now, forty years later, millions of people are involved in exercise of one kind or another... and, finally, the scientific and medical communities have become involved.

But in spite of the fact that literally tens of millions of dollars have been spent on research in the field of exercise physiology during the last twenty years, the subject of exercise still arouses more in the way of controversy than agreement.

The potential benefits of exercise are now obvious, at least to some people... but there is certainly nothing even approaching agreement on the type of exercise that is required to produce those benefits.

The present controversy exists, I believe primarily because there has been no reliable method to measure either the effects of exercise or the results of exercise.

DEFINITION... as used in this article, the word 'effect' means the immediate consequence of exercise. The word 'result' means the eventual consequence of exercise, if any; the physiological change caused by the exercise, good or bad. Exercise always produces an effect, but it does not always produce a result. Certainly not a desirable result.

Since it has been impossible to accurately measure either the effects of exercise or the results of exercise, research has done more in the way of confusing the issue than it has in the way of solving the problems. Thousands of papers have been published on this subject, with nothing even approaching agreement.

In effect, we have been trying to weigh people and thus compare people... without having first invented a reliable scale. Even without having agreed on a standard for the weight.

But that situation has now been changed. Now, for the first time, it is possible to accurately measure at least some of the effects of exercise, and some of the results of exercise. Now we can stop guessing.

Using these new tools, at least four very important factors have become measurable for the first time... and the implications of these factors are obvious.

Two of these factors have at least been the subjects of some speculation in the past, with nothing in the way of resulting benefit since these factors were neither understood nor measurable. Now they can be measured, and eventually they will be understood. But even in the lack of a total understanding of these factors, a number of important questions have already been answered... at least in a practical sense.

Two other factors are totally new, and both are enormously important. The discovery of these two previously unsuspected factors has already provided the answers to a number of problems in the field of exercise physiology. Now we know why some things happen, and why some things do not happen.

Having been personally involved in the field of exercise physiology for nearly fifty years, I have unavoidably been influenced by my own experience and by my own observations... thus I have formed a number of opinions. Having read literally thousands of published papers on the subject, and having talked to several thousand people who were interested in the subject, I have also been made aware of the opinions of many other people.

However, unlike some people, I have tried to remain aware that my opinions are just that... opinions. Not facts, opinions. In this article, I will attempt to present three distinct categories of information.

These three categories are... One, facts... Two, opinions... and Three, speculations. They will not be mixed, nor confused. We are fully prepared, and able, to prove the facts I will present herein for the first time in print. When opinions are expressed I will clearly label them as opinions, and I will give my reasons for holding these opinions. When speculation is engaged in, it will be clearly labeled as such... and again, my reasons for such speculations will be given.

First, an opinion... it is my firm opinion that the information that follows is of literally enormous importance. Important to anybody with an interest in exercise.

None of this information has ever appeared before in print, and only a relatively few people are even aware that these discoveries have been made... altogether, approximately a thousand people have been given this information. Most of these people are medical doctors, a few are research scientists, and the rest are people who are directly involved in the practical application of exercise for the purpose of physical rehabilitation.

All of these people were given this information during the course of medical seminars that we have been holding on a daily basis for the last three months. Medical doctors, and others in the field of medicine with an interest in exercise physiology, have attended seminars in Ocala, Florida, for the purpose of learning about these new discoveries. To say that the interest has been great would be a gross understatement.

Personally, I believe that the importance of these discoveries is such that this information must be made available to everybody with an interest in exercise physiology as quickly as possible.

Being clearly aware that the tools that were then available for the stated purpose of measuring some of the effects of exercise, and some of the results of exercise, were actually of little or no real value... we started a program of research and development in 1973 for the purpose of producing tools that were capable of accurately measuring several physiological factors of great importance. Factors that could not be measured previously with any slightest degree of either accuracy or reliability.

Attempts to measure these factors with any meaningful degree of repeatability, or accuracy, were doomed to failure... the tools that were available for that purpose were, in a sense, worse than worthless; worse because they were misleading. The result being that theories were formulated that were based upon misleading data. Thousands of people were misdirected by utterly worthless data, and the primary result has been a situation of near chaos. Controversy, disagreement, conflicting opinions, contradictory theories... nothing even approaching agreement, and little or nothing in the way of benefit.

Thirteen years later, the controversy continues... having intensified in the meantime. But now, finally, we are in a position to do something about it. Now we can measure at least some of these factors... now we can separate the facts from the opinions.

When we first started the project intended to produce, I estimated that it would take about six months, and that it would cost approximately two-hundred-thousand dollars... but in fact it took a while longer; and cost a lot more. The time became thirteen years and the cost exceeded forty million dollars.

Frankly, had I realized just how long it would take, my age being what it was at the start, I probably would have approved the project; and it is certain that I would never have approved the project if I had realized in advance just how much it would cost.

But, after the fact, I clearly understand that it was worth all of the time and expense that was actually required. I will not live long enough to see the final consequences of these discoveries... but of one thing I am sure, the benefits will be enormous in scope, literally beyond calculation. Medical benefits, health benefits that are almost beyond price for anybody that is interested in exercise for any purpose.

What are the effects of exercise? What are the results of exercise? Why do some people produce almost spectacular results from exercise while others fail to produce much in the way of benefits? How can we produce the potential benefits of exercise? How can we avoid potential problems that are sometimes produced by exercise? How much should be exercise? How often should we exercise? How hard should we exercise?

At least some of these questions can now be answered, and the door has been opened to all of those questions.

Some of what we have been doing in the past was right, at least for some people... but some of it was wrong, at least for some people; now we know why. Apart from the proper shape of a wheel, it is unlikely that everybody will ever agree on most things... after more than eighty years of winged flight by men, there is still no agreement on the proper shape of a wing; so the discoveries that we have made will certainly not settle all of the controversy that now exists in the field of exercise physiology. Nor is it the answer to all of the questions that have been raised on the subject; but we have found the answers to several important questions, and we have provided a tool that will eventually lead to the solution of many other questions.

Nor is it my intention to imply that these discoveries were a result of the efforts of one person; on the contrary, dozens of people have been involved on a full-time basis for a number of years, and hundreds of people have been involved for shorter periods.

The reaction to these discoveries will be varied, of course... some people still realize their importance and understand the implications immediately... some people will take a wait and see attitude... some will accept the facts but question the implications... some will attempt to dispute the facts and ridicule the implications. Such is the invariable response to innovation in any field.

The typical response to innovation seems to be bred into the genes of many people... at first, they try to ignore it, hoping that it will go away, but I hereby promise people with such a response that the facts I will present herein will never go away... secondly, they attempt to ridicule an individual than to ridicule a concept, and I hereby promise people who attempt to ridicule either me or the concepts presented here that any such attempt will eventually make them look very foolish... thirdly, when ignoring an idea or attempting to ridicule an idea had failed, some people will then attack the idea, or will attack the person responsible, and I hereby promise any such people that these attempts will backfire as well... fourthly, all else having failed to stop an idea, some people will eventually copy it, and I hereby promise any such people that we will defend our patents... finally having done everything in their power to kill an idea, some people will eventually attempt to steal credit for the very idea they have been fighting for years, and I hereby promise any such person that the real source of these discoveries is firmly established beyond any slightest shadow of a doubt.

In very simple terms, the response of some people to innovation is... ignore, ridicule, attack, copy, steal. Having been personally exposed to this reaction for a number of years, I am very familiar with it, and prepared to deal with it.

Fortunately, such a response to innovation is not universal... if it was, we would still be running around naked in the jungle providing food for lions and tigers.

I also suspect that some people, having been thoroughly irritated by my rather lengthy introduction, or being convinced that I have grossly overstated the importance of the facts to follow, will have ceased to read this article before reaching this point... and I hereby promise any such people that they will regret their haste, far sooner than they would ever believe, because the importance of the facts to follow is of such a magnitude that it would be all but impossible to overstate. In very plain English... it is my firm opinion that these facts constitute the most important discoveries in the history of exercise, by far. To those among my readers who disagree, I can only say... laugh now, and cry later.

Now, to the facts... ONE, we have clearly established the existence of at least two distinct types of response to exercise; some people, those we have given the designation of TYPE S, show an almost totally specific response to exercise... while other people, those we call TYPE G, show a different response, a general response.

The following charts will make this distinction very clear; but first I must describe the tests that were impossible to conduct until we developed the equipment that make such tests both accurate and repeatable.

Chart number 1 is a computer-generated composite of two separate tests conducted on the same day, on the same subject, with a time span of less than six minutes. The first test was conducted just before an exercise, and the second test was conducted immediately following the exercise... thus any difference in the test results is a clear indication of the effects of the exercise, the immediate consequence of the exercise.

Both of the tests were strength tests measuring the strength of this subject's quadriceps muscles... the combined strength of both legs.

Both tests were full-range tests, measuring the strength of the muscles over an angular range of 105 degrees, starting with the legs bent 109 degrees, and ending with the legs only 4 degrees short of full extension.

After the first test, which established the subject's starting strength level, the subject was exercised to a point of momentary muscular failure against the selected level of resistance; the level of resistance having been selected on the basis of the subject's demonstrated level of starting strength, it being our intention to provide a level of resistance that would permit approximately ten repetitions.

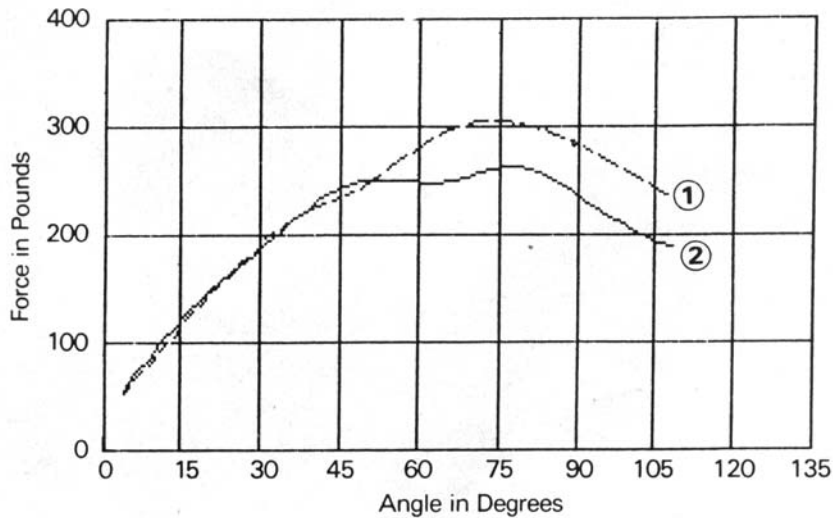
In the event, this subject was able to perform only eight repetitions, at which point he could not continue... at which point he could not produce enough force to move the resistance.

Then, immediately after having reached a point of momentary muscular failure against the selected level of resistance... the second full-range strength test was conducted.

Both of the strength tests were very near full-range tests, starting at the limit of this subject's ability to bend his legs at the knee joints, and ending only four degrees short of full extension.

BUT... the exercise was not full range; instead, the exercise machine was limited to approximately half of the possible range of movement.

Even a casual glance at the chart will make it obvious that the effect of the exercise was limited to the area in which the exercise was performed; there was no effect whatsoever in the area in which exercise was not performed... a totally specific response to exercise, specific to the area worked.



POST-EXERCISE TEST	Date: 1/2/86	Time: 16.11:24	Subject: 199					
Degree of Angle:	4	20	34	50	64	80	96	109
Pounds of Force:	55	143	201	249	247	262	216	187
PRE-EXERCISE TEST	Date: 1/2/86	Time: 16.05:35	Subject: 199					
Degree of Angle:	4	21	34	50	64	80	93	109
Pounds of Force:	51	143	204	245	291	301	275	232

CHART No. 1... A composite chart showing two full-range tests... before exercise (1) and immediately after exercise (2). The difference between the two tests accurately depicts the effect of the exercise, the immediate consequence of the exercise.

Both tests were full-range tests... but the exercise was a limited-range movement. This chart clearly depicts the totally specific effect of the exercise in a TYPE S subject... all of the effect being limited to the worked area, with no effect in the unworked area.

Based upon tests conducted on a total of six-hundred people, it now appears that approximately seventy-two percent of a random group of people will display such a specific response to exercise.

Within a matter of a very few months, we will have a much more accurate picture of the population dispersal in regard to this specific response; starting almost immediately, we are going to conduct such tests on a total of more than 20,000 subjects... at the rate of several hundred per day. These tests will be conducted under the personal supervision of Dr. Mike Pollock, former president of the American College of Sports Medicine, and will be conducted on the premises of the University of Florida School of Medicine, where Dr. Pollock is now a professor.

Such a clear response to exercise, such an effect from exercise... raises several very interesting questions. Some of which we have already answered.

For example... while we have clearly established with TYPE S subjects that limited-range exercise will produce only a limited-range effect, it does not necessarily follow that it will produce only limited-range results. Perhaps the results will be produced even though no measurable effect is produced.

But that question has been answered... limited-range exercise produces only a limited-range effect in a person with TYPE S response, and little or nothing in the way of results in the unworked range of movement. Both the effects and results are largely restricted to the worked area.

The first test, the pre-exercise test, has been marked with the figure 1 enclosed in a circle... the second test, the post-exercise test, has been marked with a figure 2 enclosed in a circle. On this chart, any vertical displacement of the two strength curves indicates a change in strength... note that the effect of the exercise is limited to the range of movement involved in the exercise, and that there was no effect in the range of movement where exercise was not performed. This subject's strength in the quadriceps muscles was momentarily reduced, as an effect of the exercise, by an average of approximately seventeen percent, but only in the worked area.

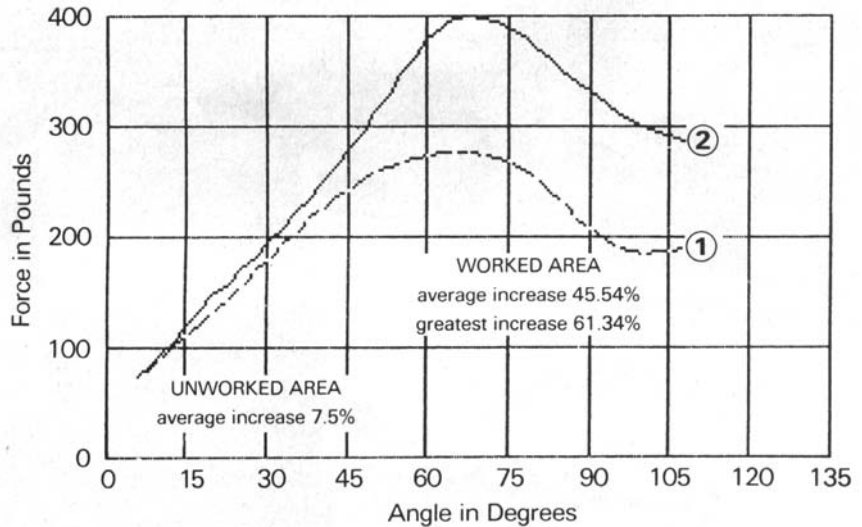
In contrast, in the unworked area of movement, his strength was not reduced at all... in fact, the post-exercise test actually indicated a slight increase in strength in the unworked area, slightly less than a one percent increase in strength in the unworked area.

The following chart will make this clear; but I must first point out a difference between this chart and the earlier one... the second chart, marked number 2, does not show the effects of exercise, instead, it shows the results of exercise, the long-term benefits of exercise, in this case an increase in the strength of the quadriceps muscles.

This chart is a composite of two tests, both of which tests were pre-exercise tests; both of which tests were performed to measure the starting strength of this subject. The first test, marked with a figure 1 enclosed in a circle, was performed on October 28, 1985... the second test, marked with the figure 2 enclosed in a circle, was performed on February 8, 1986.

The difference between these tests indicates the changes in strength that occurred over a period of 103 days... as a consequence of only fourteen exercises.

This subject was tested before exercise then exercised in a limited range of movement, then tested immediately after the exercise, on fourteen separate occasions over a period of 103 days... the strength curves depicted on this chart represent this subject's strength prior to the first exercise and prior to the fifteenth exercise... thus the resulting increase in strength is a consequence of only fourteen exercises.



TEST No. 2	Date: 2/8/86	Time: 12:56:51	Subject: 199					
Degree of Angle:	8	20	34	50	64	80	95	109
Pounds of Force:	77	142	211	307	391	372	313	285
TEST No. 1	Date: 10/28/85	Time: 13:46:18	Subject: 199					
Degree of Angle:	6	20	35	43	64	80	94	110
Pounds of Force:	72	128	200	234	275	253	194	190

CHART NO. 2... Results of exercise on a TYPE S subject over a period of 103 days.

A total of only fourteen exercises were responsible for these results... eleven partial-range exercises in the 'worked' area (on the right side of the chart), plus one mid-range exercise, one partial-range exercise in the 'unworked' area (on the left side of the chart) and one full-range movement exercise, the leg press.

The average strength increase in the 'worked' area was 45.54%, and the greatest point of improvement was 61.34%... whereas, in the 'unworked' area the average increase was only 7.5%.

In the worked area of movement, this subject increased his strength in excess of 45 percent... and a bit more than 61 percent in the area of greatest improvement.

Whereas, in the unworked area of movement, he showed an improvement of only seven and a half percent... which might lead to the conclusion that he produced at least a slight improvement in the unworked area; and perhaps he did... but, personally, I doubt it. I believe that the slight improvement shown in the unworked area was produced by the tests, since this subject was tested twenty-eight times, before and after each exercise. Also... it should be noted that two exercises were performed in the 'unworked' area, and these undoubtedly contributed to the strength increase in that area of movement.

However, regardless of the source of the slight improvement shown in the unworked area, it should be obvious that the results of the exercise were specific to the worked area.

Nor should the magnitude of the results be overlooked... the subject increased his strength approximately 45 percent, on the average throughout the worked area, as a consequence of only fourteen exercises, an average increase in strength in excess of 3 percent from each exercise session.

Reliability of the tests? Repeatability of the tests? Almost 100 percent... so close that no measurable degree of error exists.

And please do not waste your time, or mine by trying to insist that such a level of accuracy is impossible... it was impossible, but not now. Given the right tools, it is simply amazing just how accurate you can get with measurements... and anything less is utterly worthless, or worse.

For the information of any skeptics, I will point out the fact that anything in excess of an effective drop of one-half inch will result in a hard landing in an airplane... with a straight drop of four and one-half inches almost everything breaks. Yet it is possible to land an airplane without breaking things... I have been doing it for nearly forty-seven years, and have done it literally tens of thousands of times, and never broke anything that I didn't intend to. My point being that you can produce very accurate and very repeatable results, given the right tools... but it is also a good idea to note that in the early days of flying, before they had good tools, they did manage to break things, and people, on a fairly regular basis.

Today, they still break things, and people, with airplanes, but when they do, it is seldom the fault of the tool; very close to one hundred percent of all airplane accidents are the fault of the people misusing the tool, not the fault of the tool itself.

My first point, my first fact, should now be established... some people show a specific response to exercise; at least on one end of the movement. But what about the other end of the movement? Well, the next two charts will establish that point in a very clear manner.

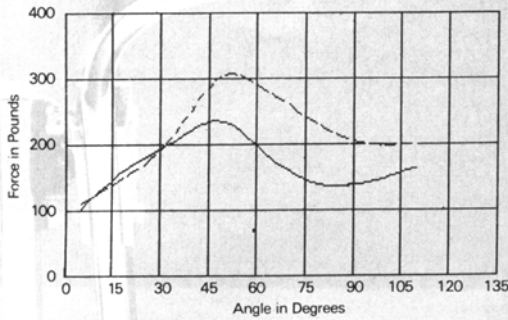
The next chart, number three, shows the composite tests on another subject with a TYPE S response to exercise... except for the difference in subjects the tests were identical to those shown by chart number one, full-range test, limited-range exercise, full-range test.

The response shown is typical of TYPE S people, the effect being limited to the worked area. Then, later the same day, we retested the subject, then exercised him to a point of momentary muscular failure with a limited range of movement... but this time on the other end of the exercise; instead of the first half of the exercise, he performed the last half of the exercise. Then we immediately tested him again to determine the effect of the exercise. See chart four.

Again... total specificity of effect, but this time on the other end of the movement. While being worked to a point of momentary muscular failure on the one end of the movement, this subject actually continued to recover (from the earlier exercise) on the other end of the movement.

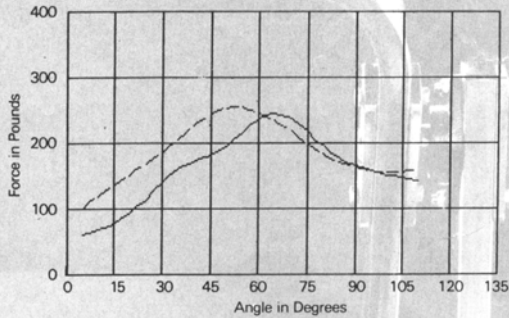
Just how specific can you get? While part of his muscle was being worked to a point of momentary muscular failure, another part of the same muscle was continuing to recover from the earlier exercise. It is also interesting to note that three of the tests duplicated their results with almost no difference. During the first test, prior to the first exercise, the subject tested 108, 151 and 210 for a total of 469 near the end of the movement, in the area of movement that we were not going to exercise during that test session... then, following the exercise on the other end of the movement, his post-exercise test produced the following in the exercise on the other end of the movement, his results in the same position, 102, 162 and 205 for a total of 469. Indicating no change in strength in the unworked area. Then, approximately 48-minutes later, during the pre-exercise test of the second testing session, in the same positions he tested 99, 105 and 203 for a total of 452, indicating a very slight loss in strength of less than four percent. Which slight loss of strength could easily have been the result of the fact that he had been tested twice in those positions less than an hour before his third test.

CHART NO. 3 . . . Typical TYPE S response to exercise, the effect of partial-range exercise being limited to the worked area (right side of chart).



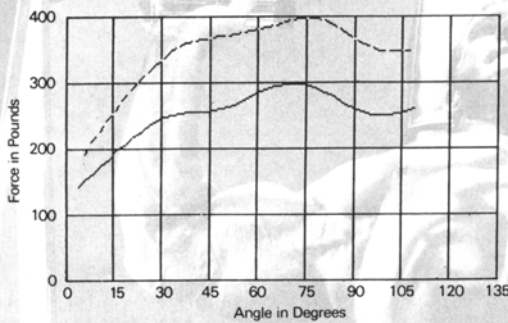
POST EXERCISE TEST		Date: 10/26/85	Time: 12:38:09	Subject: 074				
Degree of Angle	5	20	35	49	65	80	94	110
Pounds of Force	99	150	203	251	232	183	157	157
PRE EXERCISE TEST		Date: 10/26/85	Time: 11:41:18	Subject: 074				
Degree of Angle	5	20	34	51	63	80	94	110
Pounds of Force	108	151	210	305	282	228	200	200

CHART NO. 4 . . . While being worked to a point of momentary muscular failure on one side of the movement, shown on the left side of the chart, this subject was actually continuing to recover on the other end of the movement.



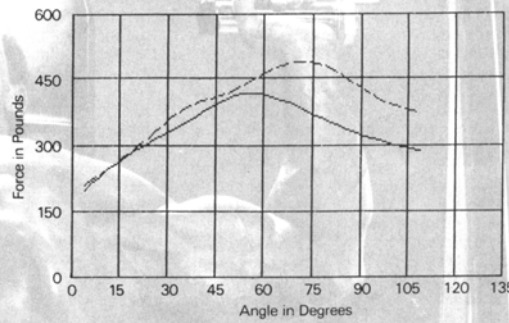
POST EXERCISE TEST		Date: 10/26/85	Time: 12:46:04	Subject: 074				
Degree of Angle	5	20	34	51	64	80	94	110
Pounds of Force	60	91	155	197	243	195	158	142
PRE EXERCISE TEST		Date: 10/26/85	Time: 12:38:09	Subject: 074				
Degree of Angle	5	20	35	49	65	80	94	110
Pounds of Force	99	150	203	251	232	183	157	157

CHART NO. 5 . . . TYPE S subject tested before and after full-range exercise, unlike the previous charts which showed the effects of partial-range exercise. The subject showed full-range effect, with a strength change varying between 25% and 29% for an average of 27%—consistent throughout the entire range of movement, plus or minus only 2%.



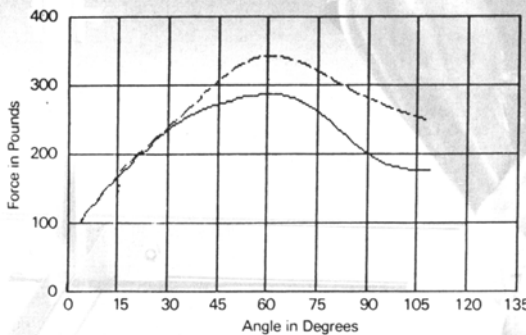
POST EXERCISE TEST		Date: 10/9/85	Time: 13:21:24	Subject: 493				
Degree of Angle	4	20	33	50	64	81	95	109
Pounds of Force	140	209	248	260	290	285	251	258
PRE EXERCISE TEST		Date: 10/9/85	Time: 13:13:04	Subject: 493				
Degree of Angle	6	20	35	49	66	80	94	110
Pounds of Force	192	281	350	370	386	395	355	346

CHART NO. 6 . . . The effect of limited-range exercise on the same subject as in the previous chart. Again, an effect typical of TYPE S subjects: Pain in the region of the subject's shins accounts for what might appear to be some effect in the unworked area.



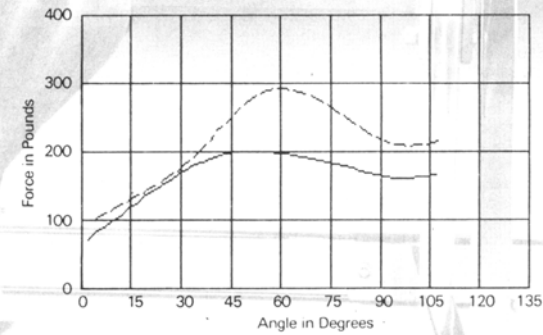
POST EXERCISE TEST		Date: 12/3/85	Time: 12:22:05	Subject: 493				
Degree of Angle	4	21	36	50	65	79	95	111
Pounds of Force	196	290	348	408	404	356	311	282
PRE EXERCISE TEST		Date: 12/3/85	Time: 12:13:17	Subject: 493				
Degree of Angle	4	21	36	50	67	79	95	109
Pounds of Force	209	295	382	421	482	479	407	373

CHART NO. 7



POST EXERCISE TEST		Date: 12/3/85	Time: 14:10:12	Subject: 222				
Degree of Angle	4	19	34	50	65	79	93	109
Pounds of Force	105	183	247	277	284	246	192	174
PRE EXERCISE TEST		Date: 12/3/85	Time: 14:00:44	Subject: 222				
Degree of Angle	4	21	36	50	65	79	96	109
Pounds of Force	101	198	262	322	340	309	268	247

CHART NO. 8



POST EXERCISE TEST		Date: 11/15/85	Time: 14:17:48	Subject: 177				
Degree of Angle	2	21	33	50	64	81	95	109
Pounds of Force	70	137	175	199	193	175	160	167
PRE EXERCISE TEST		Date: 11/15/85	Time: 14:09:16	Subject: 177				
Degree of Angle	4	17	36	50	64	81	95	111
Pounds of Force	99	134	199	271	289	245	209	220

It should also be noted that the effect of the exercise was almost exactly the same on both ends of the movement. On one end of the movement, the starting end, the exercise reduced his strength an average of 29.7 percent in the worked area... while producing no change in the unworked area.

Later, on the other end of the movement, the exercise reduced his starting strength level an average of 28.4 percent... while the previously worked area on the other end of the movement actually continued to recover from the effect of the exercise performed more than three-quarters of an hour earlier, and increased in strength by slightly more than one percent.

So, the effect of the exercise was duplicated almost exactly, with a variation of only 1.3 percent. And, again, please don't waste time trying to argue that such a degree of accuracy is impossible; try landing on an aircraft carrier some time and you will quickly realize just how accurate you can get... or, if not, you will find out how dead you can get.

So, we do have a specific effect on both ends of the movement, and we do have very close to the same degree of effect. Although, in fact, it is seldom as close as the results produced above indicated... if, for no other reason, the simple fact that these tests involve people. People who are worked very hard, working literally to the limits of their momentary ability... and it is something approaching a miracle when people working that hard produce exactly the same results when tested to their limits three or four times in a short period. The following chart is actually a better example of the sort of results that can generally be expected from a cooperative subject. In this case, the subject, although a TYPE S subject, was tested before and after full-range exercise, in order to test his reaction to full-range exercise, so we could compare his reaction to full-range exercise to his reaction to limited-range exercise. See chart five.

When exposed to full-range exercise, this TYPE S subject displayed full-range effect, which is typical of TYPE G subjects... with a very uniform loss of strength as an immediate effect of the exercise, throughout the full range of movement. His greatest loss of strength in any position was 29 percent, while his lowest loss of strength was 25 percent, for an average of 27 percent... consistent throughout the entire range of motion, plus or minus only two percent.

The following chart, number six, shows this same subject's response to limited-range exercise; an effect typical of TYPE S subjects... although, in this instance, there appears to be a slight effect in the unworked area, this apparent slight effect was actually the result of the fact that he was suffering some pain in the region of his shins.

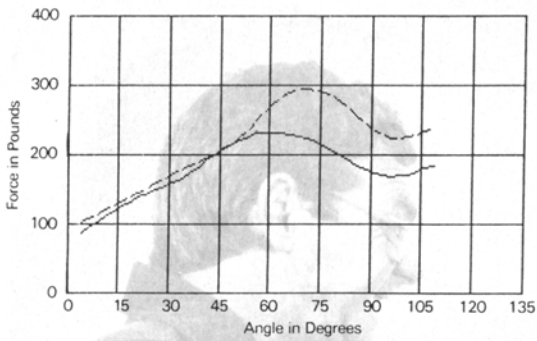
The previous charts were produced by three different subjects; the following five charts, numbered seven through eleven, are the composite test results of five other subjects, in all cases showing their response to limited-range exercise. So, altogether, I have given you eight examples of TYPE S individuals; they are not rare. Quite the contrary, as stated earlier, it appears that approximately seventy-two percent of a random group of people show TYPE S response to exercise.

The next four charts, numbered twelve through to fifteen indicate the response to exercise for four other TYPE S individuals, bringing out number of examples to an even dozen... but this time there is yet another difference; these charts show the effects of a different exercise, an exercise that many people consider to be a full-range exercise, although in fact it is not a full-range exercise.

In earlier examples, the exercise was always leg-extension, a rotary-form, single-axis exercise, full-range exercise for the quadriceps... although as indicated earlier, the exercises were always performed in a limited-range manner, doing only part of the possible movement, on one end or the other. The one exception being when we tested a TYPES S individual in order to show his response to full-range exercise.

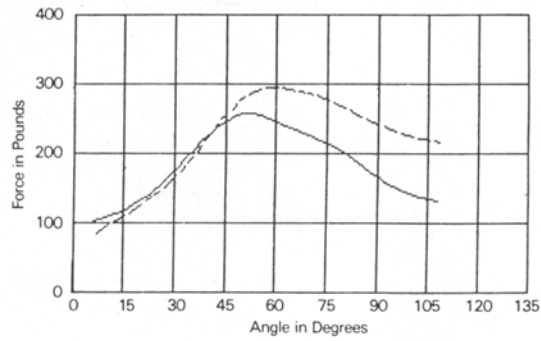
But in the next four charts we show the effects of a leg-press when performed by a TYPE S individual... and while the leg moves from a full-bent starting position to a full extended finishing position during the exercise, there is actually no resistance on the muscles at the end of the movement since the leg is then locked-out and the resistance is supported entirely by the bones, and... there is not enough resistance I the last half of the movement to effect the muscles.

CHART NO. 9



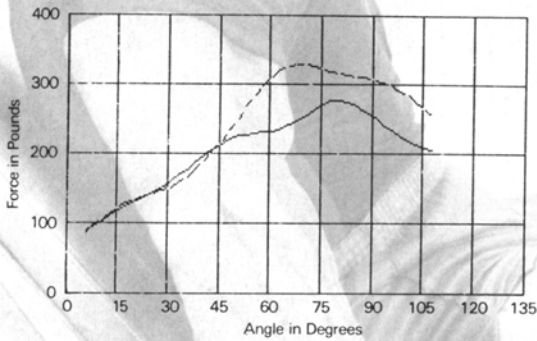
POST EXERCISE TEST		Date 12/3/85	Time 12:45:25		Subject 402			
Degree of Angle	4	21	35	50	64	78	95	109
Pounds of Force	85	136	168	218	230	208	169	184
PRE EXERCISE TEST		Date 12/3/85	Time 12:37:17		Subject 402			
Degree of Angle	4	21	35	50	65	81	95	109
Pounds of Force	101	143	183	218	285	276	225	238

CHART NO. 10



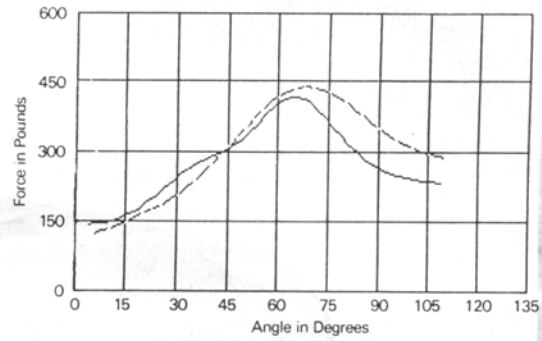
POST-EXERCISE TEST		Date 11/14/85	Time 11:40:01		Subject 349			
Degree of Angle	6	19	36	50	65	79	95	109
Pounds of Force	101	126	203	256	-235	205	151	130
PRE EXERCISE TEST		Date 11/14/85	Time 11:30:52		Subject 349			
Degree of Angle	7	21	34	51	65	79	95	110
Pounds of Force	83	126	183	280	291	268	231	214

CHART NO. 11



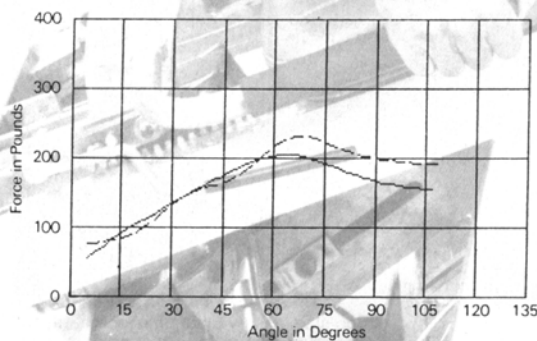
POST EXERCISE TEST		Date 1/10/86	Time 17:37:56		Subject 280			
Degree of Angle	6	20	34	50	64	80	97	110
Pounds of Force	87	127	168	222	235	275	229	200
PRE EXERCISE TEST		Date 1/10/86	Time 17:30:40		Subject 280			
Degree of Angle	6	20	34	50	64	80	96	109
Pounds of Force	85	132	158	243	320	316	296	251

CHART NO. 12



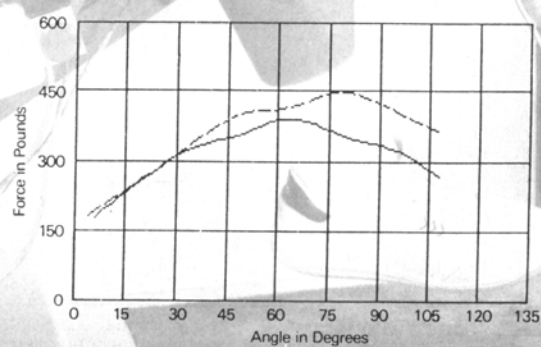
POST-EXERCISE TEST		Date 11/3/85	Time 14:30:21		Subject 486			
Degree of Angle	4	19	34	50	65	79	95	109
Pounds of Force	141	173	264	328	418	333	249	232
PRE EXERCISE TEST		Date 11/3/85	Time 14:19:28		Subject 486			
Degree of Angle	6	21	36	50	64	79	95	111
Pounds of Force	120	166	238	346	432	413	327	286

CHART NO. 13



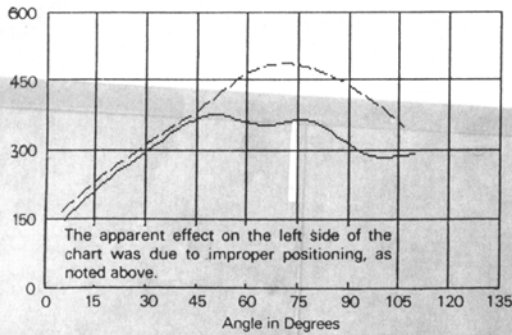
POST EXERCISE TEST		Date 11/2/85	Time 12:18:47		Subject 371			
Degree of Angle	5	19	34	48	65	79	96	109
Pounds of Force	55	100	143	180	204	184	160	154
PRE EXERCISE TEST		Date 11/2/85	Time 12:12:56		Subject 371			
Degree of Angle	5	19	36	50	65	79	94	110
Pounds of Force	76	89	149	174	228	215	198	190

CHART NO. 14



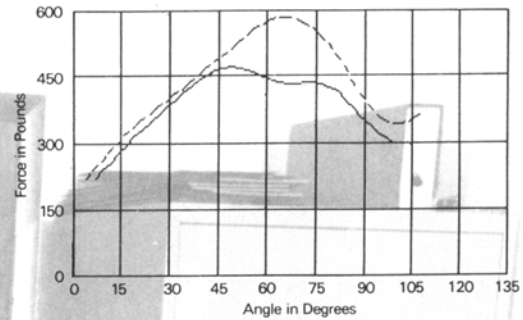
POST EXERCISE TEST		Date 11/2/85	Time 14:41:10		Subject 493			
Degree of Angle	6	19	35	50	64	80	95	109
Pounds of Force	175	251	326	359	390	352	323	264
PRE EXERCISE TEST		Date 11/2/85	Time 14:32:09		Subject 493			
Degree of Angle	4	18	35	50	64	78	95	109
Pounds of Force	179	248	338	401	416	449	407	360

CHART NO. 15



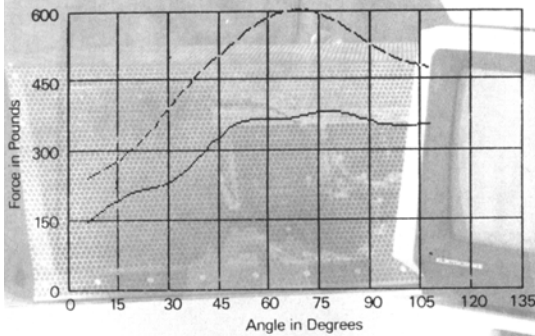
POST-EXERCISE TEST		Date: 11/2/85	Time: 13.07.15	Subject: 130				
Degree of Angle	5	19	34	50	65	79	94	112
Pounds of Force	138	233	314	377	354	364	295	296
PRE-EXERCISE TEST		Date: 11/2/85	Time: 13.00.57	Subject: 130				
Degree of Angle	5	21	36	50	65	79	96	109
Pounds of Force	164	261	337	409	480	476	412	338

CHART NO. 16 . . . Another example of an error in the tests due to a slight change in position of the subject between the two tests.



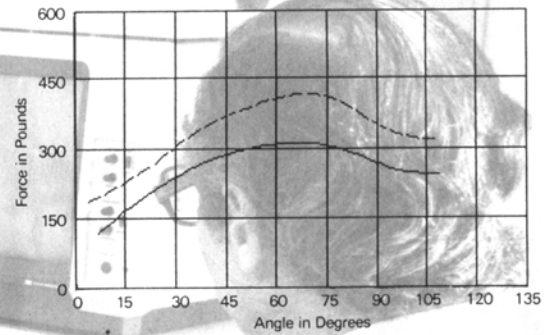
POST-EXERCISE TEST		Date: 11/7/85	Time: 16.03.52	Subject: 333				
Degree of Angle	7	19	35	50	64	81	95	109
Pounds of Force	218	308	415	471	436	420	317	299
PRE-EXERCISE TEST		Date: 11/7/85	Time: 15.59.06	Subject: 333				
Degree of Angle	4	19	33	50	64	81	95	111
Pounds of Force	218	333	416	519	582	504	355	377

CHART NO. 17 . . . TYPE G response.



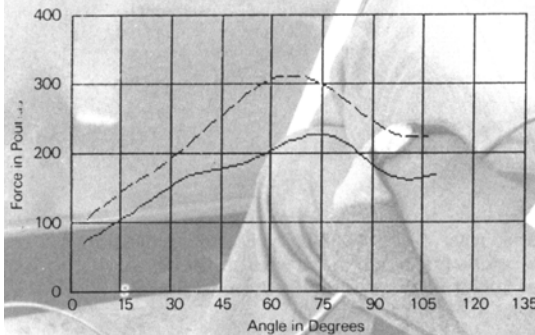
POST-EXERCISE TEST		Date: 1/9/86	Time: 11.30.13	Subject: 365				
Degree of Angle	6	20	34	50	66	80	95	109
Pounds of Force	144	207	245	352	366	381	353	356
PRE-EXERCISE TEST		Date: 1/9/86	Time: 11.23.51	Subject: 365				
Degree of Angle	6	20	34	50	65	79	95	109
Pounds of Force	139	303	421	533	599	581	508	473

CHART NO. 18 . . . TYPE G response.



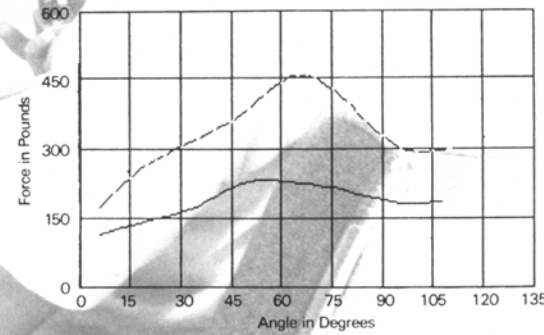
POST-EXERCISE TEST		Date: 1/4/86	Time: 13.57.59	Subject: 168				
Degree of Angle	7	19	35	49	64	80	94	110
Pounds of Force	115	182	255	293	310	297	257	242
PRE-EXERCISE TEST		Date: 1/4/86	Time: 13.49.13	Subject: 168				
Degree of Angle	4	21	35	51	66	80	94	110
Pounds of Force	183	251	328	385	416	397	336	316

CHART NO. 19 . . . TYPE G response.



POST-EXERCISE TEST		Date: 11/11/85	Time: 11.45.53	Subject: 114				
Degree of Angle	4	21	36	50	65	81	95	109
Pounds of Force	70	120	166	181	213	219	167	167
PRE-EXERCISE TEST		Date: 11/11/85	Time: 11.39.38	Subject: 114				
Degree of Angle	5	19	36	50	65	79	95	109
Pounds of Force	105	193	213	273	310	288	230	224

CHART NO. 20 . . . TYPE G response.



POST-EXERCISE TEST		Date: 11/21/85	Time: 20.15.03	Subject: 181				
Degree of Angle	6	21	35	49	64	79	95	109
Pounds of Force	113	143	173	223	226	209	182	184
PRE-EXERCISE TEST		Date: 11/21/85	Time: 20.08.18	Subject: 181				
Degree of Angle	6	23	33	50	64	78	95	111
Pounds of Force	171	266	312	382	455	412	303	300

Because, due to the enormous mechanical advantages provided by the lever system of the body in this exercise, there simply is not enough resistance in the last half of this exercise for the muscles to be effected. And... this is true in spite of the fact that the resistance in the finishing position is more than three times as high as it is in the starting position.

This exercise was performed in a machine that provides constantly increasing resistance... the lowest level of resistance being in the starting, bent-leg position... the highest level of resistance being in the finishing straight-leg position.

If the resistance is 200 pounds in the starting position, then it increases to 640 pounds in the finishing position. Yet no effect is produced in the last part of the movement with a TYPE S individual. Why?

Because, in the last half of the movement, the mechanical advantage is so great that even more than three-hundred percent of the weight is simply not enough to produce a measurable effect on the muscles.

In fact, a close look at the charts will make it obvious that some of the subjects are slightly stronger in the finishing position.

The fourth of this group of charts, numbered fifteen, was selected as an example of an error in measurement... an error due to improper positioning of the subject during the tests. If a subject changes his position between tests, even slightly, then a certain degree of error will be introduced. In this case, the slight apparent effect shown on the left side of the chart, in the finishing position of the tests, was actually an error caused by the fact that the subject was not quite in the same position each time. This change in position being caused by the fact that he had to leave the testing machine between the two tests in order to perform the leg-press exercise in another machine; then, when he returned to the testing machine for the second, the post-exercise, test, his position was changed a bit.

And... accurate test results simply cannot be produced without total control of position; if the subject moves between tests, the results will show a degree of error... and, if the subject moves enough that the movement can be seen, then the tests will be worthless. Position must be repeated exactly, with no measurable change... and believe me, such accuracy of repeatable position was not easy to produce; which is one of the many reasons that it took us thirteen years to produce testing machines with the required degree of accuracy.

Similar errors can be produced when the subject does not leave the machine between tests, and the next chart, number sixteen, is another example of such an error; although, in this instance, the exercise was a limited-range leg extension.

Having learned about the possibility of such errors, we have devised a very simple method of preventing them; once the subject is located in proper position, and locked into place, we suggest that his position is a bit wrong and ask him to move... then, if he can move, we know that he was not restrained properly. Because, if you are restrained properly, you simply cannot move... except to the degree that is required for the test, or to the degree required for the exercise if an exercise part of the test.

During prohibition, in Chicago, some of the guys had a rather quaint habit that prevented movement of any kind, to the point that it was impossible for you to wiggle your toes; not difficult, impossible. If they failed to approve of your movements or your actions, they would take you down to the dock at night, seat you in a chair and stick your feet in a large bucket of fresh concrete... then, after the concrete set, they would give you a half-way trip across Lake Michigan. Believe me, you literally couldn't move your toes.

But since we had no interest in preventing you from moving your toes, and since that method offered certain disadvantages for practical applications in the field of exercise physiology, we had to devise a faster, a better and a far safer procedure... although it also had to provide an equal degree of restraint. And it does.

I promise you... you will be able to move with almost no restriction in the desired direction, and to the desired degree; with absolutely no restraint except the very small amount of unavoidable friction involved in any sort of machine, an amount of friction so low that it must literally be measured in ounces. About five percent of the friction involved in most machines designed for such a purpose.

Early Arthur Jones



For the first time in print, at 113 pages in length, written in 1969 and forgotten in the piles and heaps of Arthur's storage facility, comes discussions and ideas before the release of Nautilus Bulletin #1!!! Now released in the I.A.R.T. Annual yearbook Synergy 2007, Arthur discusses...

- Step-by-step on how to perform key exercises, from the first to last rep.
- Key changes to traditional bodybuilding movements to make them more effective.
- The development of a machine (that never came to fruition) that would duplicate the results in the upper body equivalent to the barbell squat.
- Bodybuilder measurements.
- The most effective pressing movement for the chest, which requires an angled bench and hand placement different than the traditional bench press.
- What body part should be over-developed in order to harmonize the body for best esthetics.
- The best biceps and triceps exercises, which use a simple pulley system with the inclusion of a chain for variable resistance.
- How to use chains and multiple chains to best effect in creating variable resistance.
- Why no machine could possibly address the nuances and responses of every individual.
- The short-term value of 'super' routines.
- Muscle growth happens in dramatic spurts, whereas strength increments are smaller and more regular; and growth always precedes strength.
- The most valuable exercise you can do.
- Vomiting is not a good thing, and what to do if you feel nauseas.
- Working with too heavy a load can cause a loss of muscle.
- Writing down all the details of a workout can be a destructive habit.
- What the average trainee should measure and how much weight he should be able to lift after two years of serious training.
- The best exercises for each muscle group.
- People vary greatly in their need for a warm-up.

Available July 2007, for details visit the I.A.R.T.'s Fitness and Education Resources section and reserve your copy of Synergy 2007, totaling 300 pages.

www.ExerciseCertification.com

And, I promise you... you will not be able to move in so far as your position is concerned; so you have the best of both, with the problems of neither... much more freedom of movement where it is required, and no movement where it is not desired.

But is such accuracy of position really so important?

Yes. Without such accuracy the results of your tests will be worse than worthless. Worse because they will be highly misleading.

To my knowledge, tens of millions of dollars have been wasted on research that was worse than worthless... because the tool that was used was worse than worthless.

Some of the machines being used for such research have errors in position of as much as forty degrees of angular movement... and errors in force measurement of several hundred percent. And some of the machines being used are even worse than that. Worthless, all of them. No wonder the published results of such research are so contradictory.

In effect... for the last fifteen years, thousands of people have been unsuccessfully trying to weigh and measure millions of subjects, without having invented either the scale or the tape measure. Then they have devised theories based entirely on utterly worthless data.

But don't blame me... I have repeatedly pointed out the faults of such a system for the last fifteen years; faults that a few other people are finally beginning to notice, even to point out in print. All I can say is... it's about time, better late than never.

But don't hold your breath until the authors or all these worthless papers rush into print to point out their mistakes; it is highly likely that a lot of this phony research will still be quoted well into the next century... worse, some of it will still be in use as a basis for medical decisions. At least some of the rot will still linger long after all of us are dead. Too strong?

Hardly. When thousands of supposedly intelligent people continue to practice things of demonstrated harm, things of no possible value, and millions of people are supposed to seek them out for medical advice, and trust in their judgment, and rely on their suggestions... then I fail to see where my stated opinions on this subject are too strong. There is such a thing as criminal malpractice, you know.

Mistakes are one thing, we all make mistakes... but fraud and phony research are entirely different matters. The primary purpose of this article is an attempt to point out many of my own mistakes... since many of the things that I have been telling people for the last forty-odd years are simply wrong. But, as it happens, I am certainly not the only guilty party... far from it; a very high percentage of the supposed experts in the field of exercise physiology have been guilty of the same mistakes... and quite a few are guilty of mistakes that I have never made, mistakes that I have been trying to point out to them for over fifteen years.

But at least my mistakes have been honest mistakes, faulty assumptions based upon insufficient data... mistakes primarily caused by the fact that I didn't have the right tools either; but at least I never make the mistake of using a tool of such obvious worthlessness.

Some people, when they finally got around to admitting that they have been using a worthless tool, tried to justify their actions on the grounds that it was the only available tool... which may be true, but which is no excuse; would you make the trip if the only ship leaving was the Titanic? Would you play if the only game in town was Russian roulette?

As the professor is supposed to have said to his class... "only ten percent of what I am going to tell you is true, but the problem is that I don't know which ten percent."

Some of the opinions that I have expressed, and some of the opinions that I will express in this article, are almost certainly wrong... but unlike the professor in the old joke, I don't know which ones are wrong; which is why I have been, and will be, very careful to label my opinions as just that, opinions. But the facts that I have stated, and will state, are just that, facts... not opinions, facts; we have proven them and reproven them. Not once, not a few times, not a few dozens times, in most cases literally several hundred times... and in all cases, far more than enough times to establish their validity as facts.

Witnesses? Hundreds of witnesses. A very high percentage of which witnesses are medical doctors.

Tests? Thousands of tests on hundreds of subjects.

Research? Several years of very careful research under the direction, one on one supervision of a board certified orthopaedic surgeon.

Hours devoted to the subject? Literally hundreds of thousands, perhaps as many as a million... but really impossible to say with any degree of accuracy.

Cost of the project? Well, in excess of forty million dollars, that we can count... and a considerable amount in excess at that figure that would not be truly accountable.

Elapsed time? Thirteen years... with over thirty years of previous experience in the field prior to the start of this project; over thirty years of experience on my part, and additional thousands of years of experience on the part of the large number of people who have contributed. Experience that made the project possible.

Along the way, we made mistakes, thousands of mistakes... mistakes that were a necessary part of the learning process; and we will continue to make mistakes in the future, unavoidably... but we will not make the mistake of stating opinions as facts.

I have already given you a considerable amount of information on the subject of TYPE S subjects, and more than a dozen examples of test charts produced by accurately testing such subjects... but, as it happened, we thought for a while that we had made a mistake on that subject; because, all of the first few dozen people that we tested happened to be, by random chance, TYPE S subjects... then, when we finally encountered the first subject who responded differently, we suspected a mistake.

But it was no mistake, some people do respond differently, and now we encounter and test them almost every day; it now appears that approximately twenty-eight percent of the individuals found in a random group show what we call a TYPE G response to exercise... G for general; these subjects show an effect in the unworked area of movement as well as in the worked area of movement.

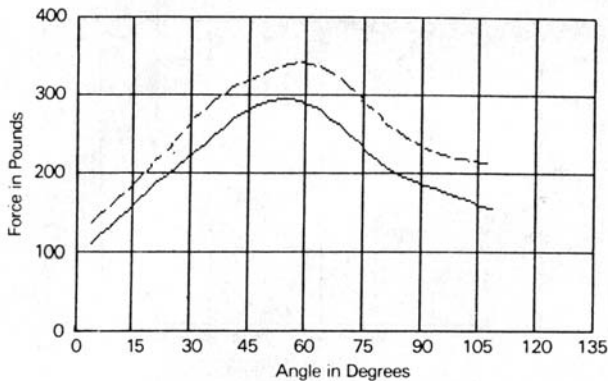
But don't ask me why, I simply don't know... nor do I even have an opinion on the subject.

The following five charts, numbers seventeen through twenty-one, are all examples of TYPE G responses. All of the first four subjects were worked and tested in the same manner as most of the previous examples of TYPE S response, full-range test, limited-range exercise, full-range test... the tests were the same, only the response was different, almost totally different.

Such subjects show an effect even in the unworked area, and frequently show more effect in the unworked area than they do in the worked area. Again, don't ask me why... I don't know.

The fifth example of a TYPE G response, chart number twenty-one, shows an effect throughout the entire range of movement... but this time an effect produced by the leg-press exercise; all of the previous four examples of a TYPE G response were produced by a limited-range leg-extension exercise.

CHART NO. 21 . . .TYPE G response.



POST-EXERCISE TEST		Date 11/5/85		Time 12 00 38		Subject 181	
Degree of Angle:	4	19	36	50	65	79	95
Pounds of Force:	108	174	244	290	276	215	177
PRE-EXERCISE TEST		Date 11/5/85		Time 11 53 39		Subject 181	
Degree of Angle:	4	21	33	50	65	79	95
Pounds of Force:	136	211	276	328	334	274	224

As previously noted, TYPE S individuals display little or now effect as a result of the leg-press exercise, in the final half of the movement. But TYPE G individuals do.

But again... simply because they show an effect in the unworked area, it does not follow that they will produces results, or benefit, in the unworked area.

Do they produce results in the unworked area?

We don't know yet for sure... but it is my present opinion that they do. I now hold this opinion because TYPE G individuals appear to have flatter strength curves than do TYPE S individuals... in the case of untrained individuals only, however.

As a percentage of their peak strength, a large group of untrained TYPE G individuals showed a higher level of strength in the position near full extension, the weakest position, when compared to a large group of untrained TYPE S individuals. TYPE G individuals, as a group, were approximately twenty-two percent stronger than a group of TYPE S individuals.

And... since neither of these groups have ever trained, I suspect that this extra strength is a result of the normal activities that most people are involved in; a carry-over from the activities that produced their strength in the peak position... a carry-over that TYPE S individuals apparently do not get.

But I also suspect that the benefits that are produced in the unworked area in TYPE G individuals, if any, are not in proportion to the results produced in the worked area.

In any case, we will know the answer to this question in the very near future... and additional speculation on the point would now be premature, at best.

Some things we know. Some we don't... but we now have the tools that will quickly answer many of our long-standing questions. And, as quickly as the new answers are provided, the information will be published.

Which covers most of the important points on the first factor, the specific effects of exercise... or a lack of same, but we still have three other important factors that I haven't mentioned.

If you are becoming bored by reading such a lengthy article, my apologies... but please remember that it is taking me a lot longer to write it than it will take you to read it; and it took many years of very careful research to provide the information contained in this article, information of literally enormous importance, facts and opinions that have never been published before... and while you may or may not appreciate or agree with my opinions, you will be forced to live with the facts that I am presenting.

So, if you are involved in exercise for any purpose, or even interested in the subject... read on; because, by the end, you may hate me, but you will at least be aware of some very important facts. Facts that have already solved some of the most important questions in the field of exercise physiology... facts that could have saved billions of hours of wasted effort if they had been known even a few years ago... facts that could have prevented millions of people from making terrible mistakes if this information had been available earlier.

Facts that will change the entire approach to exercise.. that much I can promise you; facts that will prevent an unmeasurable but vast amount of wasted effort, pain and misery; facts that will save the people in this country literally billions of dollars over the next few years.

Too strong?

I repeat... the importance of these facts is literally beyond measure.

For me, these facts came on the scene a bit too late... but the lives of hundreds of millions of people will be changed by these facts, changed for the better, and a lot sooner than most people would ever believe.

The first factor, the specific of general reaction to exercise, is certainly of great importance... for reasons that should be obvious; but the second factor is even more important, far more important.

Frankly, once this factor became obvious, I felt very foolish, because a lot of evidence has been in plain sight for many years, evidence that everybody ignored, everybody including me. Some people at least have an excuse, I was simply too stupid to pay attention, even when the evidence hit me across the face like a baseball bat, which it did.

I have even gone so far as to publish articles discussing a great deal of this evidence, but I still failed to make what should have been the obvious connections... well, as they say, twenty-twenty hindsight is easy.

On a scale of zero to one-hundred... if the first factor is a four, then this second factor is at least a ninety-nine, and almost certainly a hundred. It answers so many questions in the field of exercise physiology that I hardly know where to begin.

We have always known that people were different, but now we can measure a difference of such importance that I scarcely know how to put it into context. The obvious implications are nothing less than stunning, and the consequences will sweep out into almost every area of activity, into medicine, sports, rehabilitation.

And just what is this factor?

We don't know... but we can measure it, and the importance of this factor is of such a magnitude that it simply defies description.

Nobody in their right mind even claims to know what gravity is either... but we can measure it, and we can avoid the problems associated with it even though we don't know what it is.

We may never be able to understand gravity, but this second factor probably will be understood in the very near future, now that we are at least aware of it; I already have an opinion on the subject, an opinion that I will give you later, together with my reasons for holding that opinion.

But regardless of the validity of my present opinion about this factor, the consequences are obvious... now we know why some people can, and why some people can't, why some people do, and why some people don't; and we know what is required to take advantage of at least some of the advantages provided by this factor, and we know how to avoid at least some of the problems associated with this factor. Exercise will never be the same again, as a direct result of our final awareness of this one factor.

I have been at least aware of this factor for well over forty years... in publishing papers written nearly twenty years ago, I called it neurological ability... and I have described it as the relationship between positive strength and anaerobic endurance.

Whatever we call it, whatever it turns out to be, the ability to measure this factor accurately, and the unavoidable implications taken as a whole, may well be the single most important discover in the history of exercise.

Having exercised off and on for more than forty years, having always been a fanatic on the subject of accuracy, having very carefully measured and recorded my own results from exercise over a period of many years (measuring these results as accurately as possible with the existing tools at my disposal, all of which tools I designed and built myself since no others in existence had any slightest value), I learned that this factor remained constant... did not change, regardless of my existing level of strength, high or low or in between, regardless of my style of training, regardless of the amount of exercise I performed.

With a barbell, when performed exercises for the major muscles of my upper body (and those two qualifications are relevant), I could accurately measure my limit of positive strength by measuring my anaerobic endurance, or vice versa.

When I was able, but barely able, to lift 100 pounds only once, then I knew that I could perform exactly ten repetitions with 83 pounds... not more, not less, not nine, not eleven, exactly ten.

When I was able to perform ten repetitions with 100 pounds, then I knew that I could perform one repetition with exactly 120. When my strength changed, up or down, it did so to exactly the same degree.

Thus, when I reached a point of momentary muscular failure, after having performed exactly ten repetitions with eighty-three percent of my starting level of positive strength... then, at that point in the exercise, I failed because my remaining strength was slightly below eighty-three percent of my starting level.

So, ten repetitions with eighty-three percent of my starting strength level reduced my strength, momentarily, by about eighteen percent.

Being clearly aware of this ratio in myself, I assumed that it applied to other people as well... thus, when I encountered a man who could perform only four repetitions with eighty percent of his starting strength level, I at first accused him of not trying hard enough.

But he was trying, although I failed to recognize this at the time; that was all he could do, his ratio was different.

Later, another man performed twenty-three repetitions with eighty percent of his starting strength level, and again I was surprised.

These and other examples finally made me aware of the fact that this ratio varies on an individual basis... but I simply overlooked what should have been the obvious implications.

For years, many more years than I even like to remember, I have been telling people to train in much the same way; select a weight, by trial and error, that will permit you to perform seven or eight repetitions in good form; but continue for as many repetitions as you can, in good form. Stopping only when it becomes momentarily impossible to continue.

Then, during later workouts, always perform as many repetitions as possible... but when it becomes possible to perform ten or more repetitions in good form, then increase the weight about five percent.

Never use a weight that will not permit at least seven repetitions, and always increase the weight slightly when it becomes possible to perform ten or more repetitions. Most other people have been giving very similar advice for the last fifty years... and millions of people have trained in this manner.

But I now understand that this advice is wrong... wrong for most people; and I understand why it is wrong for more people. Right for a few, right for me, right for an unknown but probably small percentage of people selected at random, but wrong for most people.

Wrong because of the factor I am trying to describe, the factor we have not yet named, but a factor that we can measure accurately. Having measured this factor in several hundred people, the unavoidable implications are simply stunning... not interesting, not noteworthy, nothing less than stunning. Now we know why some people are so strong, and why some people are so weak... now we know why some people are so fast, and some people are so slow... now we can predict the results of exercise... now we know what to avoid and why... now, we are no longer guessing.

For more than forty years I have believed something that may not be even true, and for most of those years I have been telling people to exercise in a certain fashion that was dictated by my firm belief... and now I realized that my advice may have been wrong. I have believed, and I have repeatedly stated that intensity is the most important factor in exercise; and I have been telling people to always continue an exercise to the point of momentary muscular failure, to the point that additional movement was impossible.

That belief may have been valid, and if so then the advice was good...but now I am not so sure, one way or another... and then, right or wrong, I will publish the result of our present research immediately.

The other factor, the other requirement for good results from anaerobic exercise, the factor that is yet unsuspected by either the scientific or medical communities, the factor that has literally stunned me by the magnitude of the unavoidable implications, the unnamed factor, the factor, that will work the greatest change in the entire history of exercise... this factor relates to the effect of exercise, the magnitude of the effect of exercise.

Effect being, as I intend the term here, the immediate consequence of exercise... not the result of exercise, not the long-term benefit of exercise; rather, the short-term almost instant consequence.

Exercise always produces an effect, an immediate consequence... but it certainly does not always produce a result, a long-term benefit.

Without an effect there will be no result... that much, at least, we have already clearly established; but we have already established another fact as well... if there is only a slight effect, there will be little or nothing in the way of benefit. And, secondly, if there is too much of an effect, then the results will be bad rather than good.

Too little in the way of an effect simply will not stimulate a benefit... and too much effect will literally prevent a benefit.

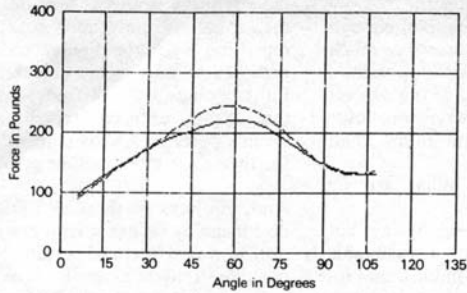
In the past, it was impossible to accurately measure either the effect of exercise or the result of exercise... now we can measure both; and having done so with several hundred subjects, the results are, to repeat myself, simply stunning.

In the past, it was impossible to accurately measure either the effect of exercise or the result of exercise... now we can measure both; and having done so with several hundred subjects, the results are, to repeat myself, simply stunning. The following two charts, numbers 22 and 23 will demonstrate this point in a dramatic fashion.

Chart number 22 shows the effect, the immediate consequence, of an exercise by a subject of a particular type... this subject performed a limited-range leg-extension exercise to the point of momentary muscular failure, to the point where movement was impossible. This subject, using the selected level of resistance, could perform only seven repetitions, and then could not continue.

The effect, in spite of having worked to momentary failure, in spite of the high intensity, was very low... almost no effect, slightly more than a three percent reduction in strength. Such an effect will produce little or nothing in the way of benefit, regardless of the length of time devoted to such training.

CHART NO. 22. . . . An extremely shallow effect of exercise. This subject's effect was only 3.05% despite training to failure (seven reps) immediately before the second test. Chart No. 23 shows a dramatic contrast.



POST-EXERCISE TEST	Date:	2/2/86	Time:	18:44:39	Subject:	290		
Degree of Angle:	6	20	34	50	64	78	93	109
Pounds of Force:	94	141	180	211	219	186	141	131

PRE-EXERCISE TEST	Date:	2/2/86	Time:	18:37:13	Subject:	290		
Degree of Angle:	6	20	34	50	64	80	95	109
Pounds of Force:	88	137	185	235	240	188	134	137

CHART NO. 24. . . . Using a different testing procedure, we see the relationship between positive strength and anaerobic endurance. The subject in this chart performed 17 repetitions exceeding 75% of her one-rep maximum, indicating a shallow effect of exercise.

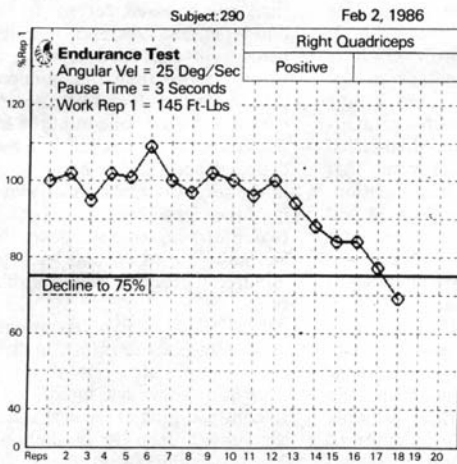
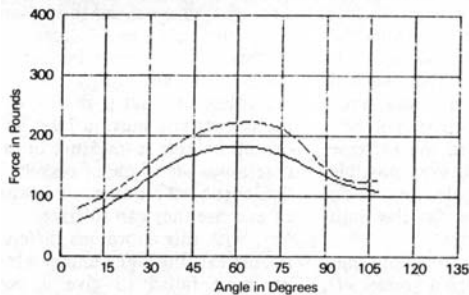


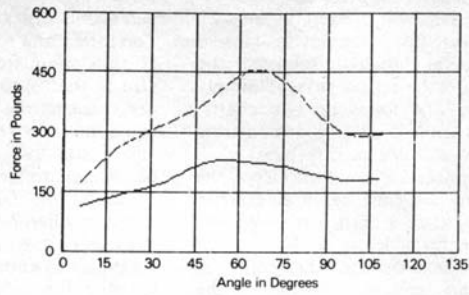
CHART NO. 26. . . . This is the chart of the same subject depicted in Chart No. 22. But the effect is entirely different. This chart shows the effect of 34 repetitions, whereas Chart No. 22 used a heavier resistance which the subject could lift only seven times before reaching momentary muscular failure.



POST-EXERCISE TEST	Date:	1/10/86	Time:	18:32:10	Subject:	290		
Degree of Angle:	6	20	34	52	64	80	95	109
Pounds of Force:	96	93	140	176	180	159	120	107

PRE-EXERCISE TEST	Date:	1/10/86	Time:	18:25:53	Subject:	290		
Degree of Angle:	6	20	34	50	64	80	93	109
Pounds of Force:	77	112	165	210	222	196	136	126

CHART NO. 23. . . . A deep effect. . . an effect exceeding 44%. This equates to 1.447% of the "effect" produced by Chart No. 22.



POST-EXERCISE TEST	Date:	11/21/85	Time:	20:15:03	Subject:	181		
Degree of Angle:	6	21	35	49	64	79	95	109
Pounds of Force:	113	143	173	223	226	209	182	184

PRE-EXERCISE TEST	Date:	11/21/85	Time:	20:08:18	Subject:	181		
Degree of Angle:	6	21	33	50	64	78	95	111
Pounds of Force:	171	266	312	382	455	412	303	300

CHART NO. 25. . . . In contrast to the subject in Chart No. 24, this subject shows a very great effect — only three repetitions above 75% of his one-rep maximum. Out of several hundred subjects tested, the range has extended from a subject who could perform only one rep with 80% of his one-rep max (deep effect) to another subject who performed 34 reps with more than 80% of her one-rep maximum.

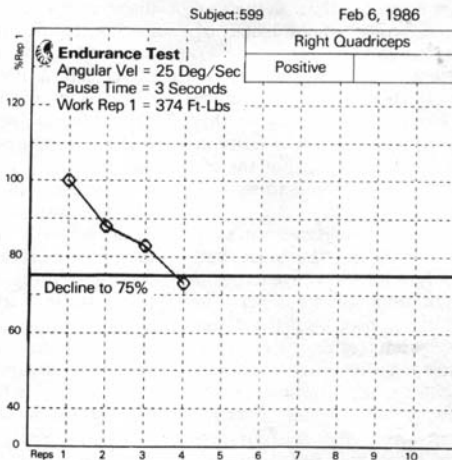
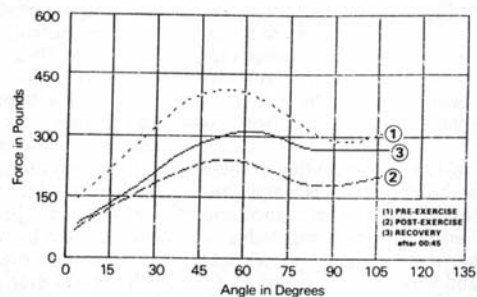


CHART NO. 27. . . . Three separate tests: (1) pre-exercise; (2) post-exercise; and (3) a "recovery" test 45 minutes after the second test. This is normal recovery for a TYPE G subject, a subject that shows full-range effect from a limited-range exercise. . . also a subject that shows a greater magnitude of effect than normal, and yet recovery was fairly rapid, at least in the worked area. Recovery was slower in the unworked area.



RECOVERY TEST	Date:	12/17/85	Time:	16:58:07	Subject:	223		
Degree of Angle:	4	18	34	50	66	80	96	109
Pounds of Force:	82	142	230	292	309	274	267	267

POST-EXERCISE TEST	Date:	12/17/85	Time:	16:13:33	Subject:	223		
Degree of Angle:	3	20	36	49	63	81	95	109
Pounds of Force:	67	140	202	237	230	183	183	206

PRE-EXERCISE TEST	Date:	12/17/85	Time:	16:02:10	Subject:	223		
Degree of Angle:	4	20	36	49	65	79	95	111
Pounds of Force:	144	248	359	409	393	328	285	321

In stark contrast... chart number 23 shows the effect produced by another subject of a very different type; this subject performed the same exercise in exactly the same manner... but the effect was certainly different, to say the least.

In fact, this subject could perform only six repetitions... if the resistance had been reduced, as it would have to be, in order to permit this subject to perform seven repetitions also, then the effect would have been even greater. Probably in excess of fifty percent. But even with fewer repetitions, this subject produced an overall strength reduction in excess of forty-four percent; more than fourteen times as much effect as that shown by the other subject... literally a different of 1,447 percent; that's right... one thousand, four-hundred and forty-seven percent. Why?

Because of genetic differences in the subjects; differences that are not subject to training effect, differences that could never be measured before... differences that determine the individual requirements for good results from exercise.

Without a clear understanding of these individual differences, it is simply impossible to determine what is good and what is bad in exercise... impossible to determine what is right and what is wrong, and why.

Without a clear understanding of this factor, exercise is nothing short of outright guess-work... you may guess right, by sheer accident, in a few cases, very few; but you will guess wrong in most cases, and when you do guess wrong then the exercises will simply be wasted effort... or worse, may produce bad results instead of benefits.

Too little... and too much. Not enough effect to stimulate growth... or so much effect that growth is impossible, prevented by the fact that the subject could not recover between workouts and would lose strength rather than become stronger.

What is this factor? What are we measuring here?

We don't know... not yet, anyway, but we expect to know within a reasonable length of time, and will publish that information when and if it becomes known.

Speculation? Opinion?

I have no opinion at this point, because I have no facts to base an opinion upon; but speculation... well, that's another matter.

Speculation, not even an opinion, just pure speculation... we may have discovered a very accurate, non-evasive method for determining fiber types. It may be that the subject with very little effect has a higher percentage of so-called slow-twitch fibers... and it may be that the subject with a great effect has a high percentage of so-called fast-twitch fibers. But remember, that isn't even an opinion, just speculation. The next two charts, numbers 24 and 25 are a totally different type of result using a different testing procedure... but these tests are intended to demonstrate the same factor.

We are dealing here with the relationships between positive strength and anaerobic endurance... and the range of difference is literally enormous. So far, out of several hundred subjects, the widest range we have encountered involved one subject who could perform only one repetition with eighty percent of his positive strength... and another subject who performed thirty-four repetitions with more than eighty percent of her positive strength.

And... since literally anybody can perform one repetition with one-hundred percent of his or her positive strength, it rather naturally follows that we will never find anybody who cannot even do one repetition with eighty percent; thus, we have established the extreme limit of variation that is even possible on one end of this scale... but we do not yet now just how far the limit goes in the other direction.

I certainly do not mean to imply that nobody will ever produce a greater effect than that which was produced by the subject who could only do one repetition with eighty percent of his strength; quite the contrary, I expect to find subjects with a much greater magnitude of effect. I simply mean that since anybody can do at least one repetition with one-hundred percent of his or her positive strength, then obviously s/he could also have done at least one repetition with the lighter resistance provided by only eighty percent.

But... perhaps we will find somebody who can do only one repetition with seventy percent, or sixty percent; and if so, then their effect will be greater.

And, you may be thinking... just what do I mean by saying at least one repetition with one-hundred percent of one's positive strength; after all, since that is how we establish the limit of positive strength, then obviously nobody will ever do more than one repetition with one-hundred percent... or so you may believe. But, in fact, some people can perform more than one repetition with one-hundred percent; as a quick glance at chart number 24 will prove. This subject performed one-hundred percent in the second repetition... dropped to ninety-six percent in the third repetition... performed more than one-hundred percent in the fourth and fifth repetitions, climbed to nearly one-hundred and five percent in the sixth repetition, and then dropped back to one-hundred percent in the seventh repetition... down slightly in the eighth repetition, back up for two more repetitions, down for the eleventh repetition, and back to one-hundred percent for the twelfth repetition.

All of those twelve repetitions were maximum-possible efforts in rapid succession... and nine out of the twelve were at or above one-hundred percent. In contrast, look at the performance of the subject depicted in chart number 25... this subject's strength dropped rapidly and he could perform only one repetition at one-hundred percent... and only three repetitions at or above seventy-five percent. This subject produced a very great effect from exercise... the other subject shows very little effect from the same exercise.

Different fiber types? Perhaps. But a factor of stunning consequence regardless of what it proves to be. A factor that you must at least be aware of and be able to measure in order to determine what type of exercise a particular subject requires... and what type of exercise s/he can tolerate.

Yet, with this enormous difference in people existing right under our noses, we have failed to give it any real notice... continued to give people the same type of exercise... and then were surprised when they failed to produce the same degree of results.

We do not yet know just how wide a range exists in regard to this factor, but it is highly unlikely that we have encountered the extreme limits in either direction... after measuring this factor in only six-hundred subjects, and having found a variation that exceeds 1,400 percent, I expect to find that the actual range is much greater.

We may find a subject who shows an effect of only one or two percent, and we may find a subject who shows an effect of ninety percent; but it is almost certain that the range is far wider than anything we have encountered so far.

In the direction of finding the answer to that question, we are starting tests on an initial total of 20,000 subjects, at the rate of several hundred per day. These tests will be performed under the supervision of Dr. Mike Pollock at the University of Florida School of Medicine, starting immediately... and preliminary results will be printed within a few months.

Why the rush? Because this factor must be understood as soon as possible, and the implications and practical applications must be made known as widely as possible and as soon as possible... because, this factor answers many of the problems that have plagued the field of exercise from the beginning. Now we can stop guessing, now we know for sure, now we can design a program of exercise based upon facts instead of superstition... and now we can start producing good results for a change. Now a coach will know how to train his athletes, properly, on an individual basis, as they must be trained; now a doctor will know how to design a rehabilitation program based upon logic, with the ability to measure both the effects and results of such a program.

This is, quite simply, the most significant discovery in the history of exercise... a discovery that will send shock waves around the world, a discovery that will change exercise forever, and change it for the better.

Probably having already exceeded the attention span of many readers, I must move on... since I still have two factors to cover, and not much available time in which to finish this first report; but one last point in regard to this second factor... look at chart number 26.

This chart shows the effect that was produced when this subject was exercised in a proper manner... the subject being the same one depicted in chart number 22, where a very slight effect was produced; such a subject is not doomed to poor results from exercise... on the contrary, this subject might well become a champion in certain sports. But such a subject must be exercised in a very definite way if good results are to be produced; and chart number 26 shows the effect of a proper exercise... proper for this type of subject, but worthless for most subjects, and possibly even dangerous for a few subjects, dangerous in the sense that some subjects would rapidly become weaker instead of stronger if exercise in this manner.

What is proper for this type of subject? What is wrong for this type of subject? What is proper for another type of subject? These and many other questions of literally enormous importance have already been established, and can be explained in a rather simple manner so that literally anybody can both understand and apply this information in a practical manner... but not within the limits of this first report. The importance of this information being what it really is, it will be published soon, in great detail, in plain English.

In the meantime, you will just have to keep guessing, but we won't leave you in doubt any longer than necessary.

The third factor also is important, of particular importance for anybody dealing with injuries who must be rehabilitated, doctors and therapists; but we really don't know a lot about the significance of this factor just yet, and it does not lend itself to a simple explanation in any case... a clear explanation, but not a brief one. And so, I will only state now that it is related to a subject's recovery ability and tolerance for exercise.

The latter type subject is the problem... people with a very slow rate of recovery must be dealt with very cautiously, their tolerance for exercise is very slow.

Chart number 27 shows three separate tests... number one was the pre-exercise tests... number two was the post-exercise test performed approximately forty-five minutes after the post-exercise test.

This is normal recovery for a TYPE G subject, a subject who shows full-range effect from a limited-range exercise... also, a subject who shows a greater magnitude of effort than normal. Yet recovery was fairly rapid... at least in the worked area, and slower recovery in the unworked area.

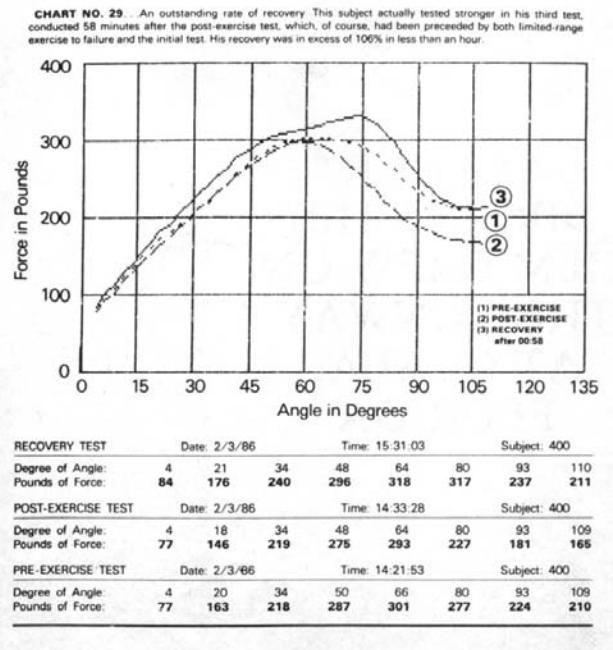
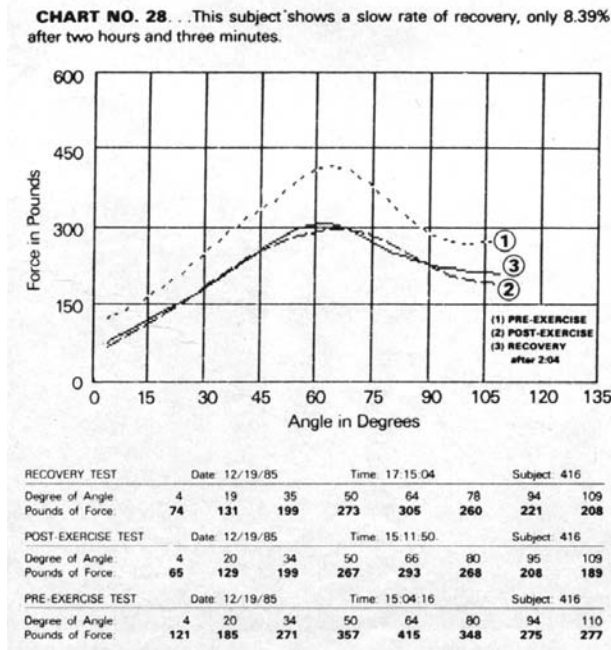
In contrast, chart number 28 shows the same three tests, but with a far different rate of recovery. This subject, in spite of the lower magnitude of effort, still displayed almost no recovery after more than two hours. After two hours and three minutes his recovery was only 8.39 percent, eight and thirty-nine one-hundredths percent; very slow indeed. Such a subject has a very low tolerance for exercise and must be handled with great caution if bad results are to be avoided; bad in the sense that a loss in strength may result if this subject is exercised in the usual manner.

On the other end of the scale, chart number 29 shows a rate of recovery that is almost unbelievable... within a period of approximately fifty-eight minutes this subject had not only recovered fully but had actually increased in strength to a level above his pre-exercise test. He recovered 106.9 percent, one-hundred and six point nine percent; was actually stronger as a result of the exercise.

So, the rate of recovery varies enormously, as these charts show; from as little as eight percent in two hours to as much as one hundred and six percent in less than an hour; and we do not yet know just how wide a variation actually exists, since this factor has been tested in only about a hundred subjects.

This, too, remains an unnamed factor; but the implications are obvious, and we are starting large-scale research into this factor almost immediately.

An awareness of this factor and an ability to measure it accurately is obviously of great importance... now we have both the awareness and the ability to measure it, and with great accuracy. Little more is known on this subject at the moment, but it will be, soon. When it is, it will be published immediately.



Now... the fourth factor; the final factor, but certainly not the least important factor. A factor of such importance that again I am really at a loss for words in my efforts to place it into proper perspective... a factor that will almost certainly save the lives of many thousands of people... a factor that absolutely will prevent millions of people from suffering needlessly. Again, a factor of no less stunning consequences in the field of medicine... a factor of such great value that I am hard pressed to even believe it, yet one that is so plain that it cannot be denied.

And, again... this remains an unnamed factor; but one that will have a name soon, a name that will become known throughout the world, and very quickly. If, on a scale of zero to one million, everything else that I have ever accomplished in my life is equal in total to only five, then the discovery of this factor is something on the order of ten million; although it may or may not be true that pride goes before a fall, I am proud of this discovery... if everything else I ever did in my life was utterly evil, then this one discovery would more than make up for it.

If, as some people would have you believe, I am the Devil himself, then the discovery of this factor might still gain me sainthood; because, the awareness of this factor, and the practical application of this factor, will prevent so much needless suffering that it is literally far beyond calculation. A thousand years after I am dead, and long forgotten, millions of people who will never have heard of me will be helped beyond measure by the understanding of this factor. Put a value on that, Gideon.

Really? It is really that important?

No... in fact, it is far more important than anything I ever dreamed of; not in dollars and cents, certainly not to me since there is nothing that I can market, nothing I can sell, but in a sense far more important than money. The ability to help millions of desperate people who would otherwise have been abandoned as beyond help. This factor was discovered over a period of thirteen years, at a cost of excess of forty million dollars... but you do not need these tools in order to make practical applications of this factor, you need nothing beyond a bit of knowledge. A bit of knowledge beyond price... although, in fact, a bit of knowledge that will save literally billions of dollars for millions of people.

More than thirteen years ago, in the Summer of 1972, I conducted a long-range research program in an effort to determine the results of what we then called Negative-only exercise... with outstanding results. Three years later, in the Fall of 1975, I wrote an article entitled The Metabolic Cost of Negative Work... and this article was published in the issue of Athletic Journal dated January 1976, which issue actually appeared in December 1975; in that article I suggested that the difference in strength between negative and positive work was a result of friction, internal muscular friction.

At that time it was speculation, a gut feeling that I could not prove... but now we have proven it, and the implications and practical applications of that bit of knowledge are simply beyond value.

You have three distinct levels of strength... your lowest level of strength is your positive strength, your ability to move against a resistance while a muscle is contracting... but your muscles can support a level of resistance approximately twenty percent greater than their level of positive strength, can remain static against this higher level of force... and you can control a force approximately forty percent above your positive level of strength, while a muscle is performing in a negative fashion, while lowering a weight.

That, quite simply, is a fact... although there are some people dumb enough to dispute it; primarily, I believe, because they never had anything even approaching an accurate tool for measuring these different levels of strength. But we do have, now.

Nobody else does, but we do; and the results of these tests were... again, simply stunning.

Chart number 30 clearly shows the relationship of strength at three distinct levels... the lower curve is the positive strength level, the bar graphs show the static strength level... and the upper curve shows the negative strength level. Both the positive and negative levels are depicted from dynamic tests at slow speed, while the static level of strength was tested isometrically.

Dynamic tests are far more difficult to conduct than static tests, and nobody else on earth can come anywhere even close to doing so accurately as we can... but neither of the curves are perfect. Most such tools are utterly worthless, the rest being worse.

Worthless or worse because several very important considerations must be clearly understood and properly dealt with before you can even start to perform meaningful tests... considerations that nobody else even likes to think about, because they don't know how to deal with them. Problems they can't solve, problems that we have solved... gross inaccuracy that they have hidden or denied, meaningless results that can be shown to be utterly worthless by a few simple tests. Errors in force that run into the hundreds of percentile of error, errors in position that are so bad that the tests would be worthless even if the force measurements were accurate, which they are not.

Millions of dollars have been wasted on research based upon such tools, research that was utterly worthless, or worse; worse because it was not only meaningless but dangerous. And just what have they discovered as a result of all this research? Absolutely nothing.

Standard of the Industry... indeed. Reliable data... indeed. The only thing they have managed to establish during the last fifteen years is the simple point that Barnum made famous over a hundred years ago... there is a sucker born every minute, and two to take him.

But, now, finally, after more than fifteen years, after I have been pointing out the fact that these tools are utterly worthless all during those years, at least a few people did get around to conducting the simple tests that they should have conducted years ago; tests that clearly establish the fact that these tools are worse than I could possibly make you believe. Calling them worthless is greatly over-rating them, giving them the benefit of a doubt that they do not deserve.

Some of these few souls have even had the courage to print the truth, to point out the facts for a change. It's about time.

Now the same people who brought you one outrage are going another great step in the same direction... but this time they have gone way too far; ruining a few thousand knees is bad enough, but destroying a few million already-injured lower backs is going just a bit too far. You can live with a ruined lower back; and, if they are able to foist their latest outrage off on a gullible public, then they certainly will ruin a bunch of lower backs. And they have the audacity to call it aggressive rehabilitation; it certainly is aggressive, but it just as certainly not rehabilitation, and anybody dumb enough to believe otherwise and act accordingly, following their advice, will quickly learn to regret having done so, I promise you... anybody using such equipment is going to meet a lot of lawyers, and they won't like the experience.

Remember... as I said much earlier in this article, there is such a thing as criminal malpractice, and ignorance is no excuse. If some people object to my comments, let them sue me... if they dare; I really hope they are dumb enough to do so, it will be a downright pleasant experience, for me. The end of the line for them; an end that is badly overdue... fraud and phony claims must eventually be stopped, particularly in the field of medicine.

Too strong? Sue me. Nothing I could say is even strong enough. Ask Gideon what happened when he sued me; but don't be dumb enough to take his word for it, check the court records, read the testimony in the depositions, it is all on record, and so you don't have to take my word either.

And what, you may ask, has all of this to do with the point?

Just everything, because this whole field is knee-deep in fraud, phony claims, faked research and assorted other outrages; which situation led us to start on the thirteen year project that finally developed the tools that are required to conduct meaningful tests, accurate tests, repeatable tests. The tools that then lead us to the discovery of the four factors I am trying to describe the discovery of which factors constitutes the greatest breakthrough in the history of exercise physiology. Remember what I said much earlier... laugh now, and cry later.

As Liberace said when somebody asked him if the stories then in circulation were disturbing to his brother... "yes, he is terribly disturbed, he cries all the way to the bank every morning."

And just what is the fourth factor, the fourth discovery? And why is it so important?

ONE... the ratios between positive, static, and negative strength are well established.

TWO... but only for a fresh muscle.

THREE... because, the difference in strength is the result of internal muscular friction; and friction does not become fatigued.

FOUR... therefore, as a muscle tires the ratio of strength changes; changes dramatically. Within the last few days we demonstrated a ratio in excess of 57 to 1 in a fatigued muscle. When the muscle was exhausted to the point that the positive strength level was only 2.1 percent of the starting strength (two and one-tenth percent), the negative strength was still in excess of 120 percent of the starting positive strength level (more than one-hundred and twenty percent)... when the positive output was only 3, the negative output was 173.

BUT PLEASE NOE THE FOLLOWING... from these data it appears that the subject's starting positive strength level was reduced by ninety-seven point nine percent (97.9%), and that his starting negative strength level was reduced by only eighteen point nine percent (18.9%)... thus, the starting level of friction in the muscle could not have remained constant, nor could it have declined; this result could occur only if the friction had increased during the exercise, and perhaps it did... but if not, then some as yet unknown additional factor is obviously still lurking in the bushes, still to be discovered.

But regardless of what actually occurred, for practical applications, it really doesn't matter; we can still use this enormous reserved of negative strength, no matter what the source, to great benefit, particularly in rehabilitation.

FIVE... when this subject became so tired that he literally could not move his lower leg in a positive manner, his negative strength was still enormous. One or two more repetitions would have reduced his positive strength to a point of literally below zero, and his negative strength would still have been enormous; at that point the ratio between negative and positive strength would have been infinite... think about it, how many times will zero go into any finite number, an infinite number.

SIX... the implications? Obvious, but I will spell them out; a muscle that is weak to the point that it is unable to produce movement can still be exercised in a meaningful manner, but using pure negative exercise. A muscle that is so weak that it can produce no measurable force, can still produced enormous force when tested negatively. A limb that is hanging in an utterly useless manner, can still be exercised with negative work... and, if the never is still alive, it will respond.

Put a value on that bit of information. If you can. Just don't forget where you read it first.

Other implications of great value are far too numerous to go into detail herein, but additional information on this subject will be forthcoming almost immediately.

When the above mentioned subject was tested, the test was conducted in the following manner... FIRST, his maximum-positive level of positive dynamic strength was measured at a slow speed of angular movement, 25 degrees per second, though a full range of movement for the quadriceps... SECOND, then his maximum-possible level of negative dynamic strength was tested at the same speed, and this established that his negative strength was approximately 40 percent higher than his positive strength... THIRD, the computer then factored his positive strength level of by point seven (.7) and drew a curve representing a level equal to seventy percent of his positive strength... FOURTH, the subject then exercised in a submaximal manner, both positive and negative, while trying to maintain a force equal to the displayed curve. Which curve represented seventy percent of his starting strength level but only fifty percent of his starting negative strength level. During the first eleven repetitions, both positive and negative, the efforts were below maximum... but, after the eleventh repetition, the muscle was so fatigued that it then became necessary to perform at a maximum level in order to even approach the target level, at least during the positive part of the exercise... whereupon, all following repetitions were performed at a maximum level... and, the changes in the ratio between positive and negative force became obvious, and were calculated almost instantly and displayed on the screen as a digital ratio... then, the ratio continued to change, repetition by repetition; during the twelfth repetition it was two to one, during the fourteenth repetition 5.4 to 1, during the sixteenth repetition 7.5 to 1, during the twentieth repetition 30.1 to 1, and finally during the twenty-fifth repetition it was 57.2 to 1, the negative strength was more than fifty-seven times as high as the positive strength.

During the last few repetitions this subject was literally unable to move his leg... the machine was required to do most of the work of lifting his leg, while he contributed as much force as possible, which force by that point was very little.

Yet, during the negative part of the exercise, he could and did produce an enormous level of force... produced such force from a muscle that was tired to the point that it could not even start to move his lower limb in a positive fashion.

Following the exercise, he literally could not move... in a positive manner. The implications for the rehabilitation of traumatized, terribly atrophied patients should be obvious... and we will spell them out in later publications. But be informed in the meantime... the simple fact that a patient cannot move a limb does not necessarily mean that the limb is dead, beyond hope; test the patient in a negative fashion and you may be stunned by the results. So long as the nerve is still alive there is hope... but if you fail to rehabilitate the muscle then the nerve may die, and then there is no hope.

If you are seriously involved in rehabilitation, or interested in exercise for any purpose in the field of medicine, then the knowledge that is now available as a result of the discovery of these factors is of enormous value to you... we have been involved in this project for thirteen years, and the School of Medicine at the University of Florida, in Gainesville, has been involved for approximately five years, and we have been conducting careful research with traumatized patients in a clinic under the personal supervision of a board-certified orthopaedic surgeon for more than seven years, primarily with lower-back problems but with a large variety of injuries, and we have been conducting research with osteoporotic women for several years, again at the School of Medicine in Gainesville... so, the information contained in this first publication is neither hasty nor ill-considered; quite the contrary, it is the most carefully researched information in the history of exercise physiology, the first information of any significance on the subject of anaerobic exercise since we introduced the concept of variable resistance nearly eighteen years ago.