The Future of Exercise
(1997 and Beyond)

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Some readers may object to the amount of repetition I have engaged in during the writing of the preceding chapters, but experience has taught me that repetition is a requirement for meaningful communication. One of the major problems facing any writer is the fact that the written word does not mean the same thing to all of the intended readers; and a second problem results from the fact that the writer gets no “feedback” from his audience.

An experienced speaker, when addressing an audience face to face, soon learns to “read the audience,” is almost instantly aware of the situation when an audience fails to understand one of the speaker’s statements; and this awareness of the response of an audience provides the speaker with an opportunity to try another approach, to use a different example in an attempt to establish a point. An example that is perfectly clear to some people may be meaningless to other people; the ability of people to understand any statement depends upon their previous experiences, and no two people on the Earth have had exactly the same experiences.

Another advantage that is provided to a speaker in front of a live audience results from the fact that members of the audience can ask questions if they fail to understand something; and, of course, a writer has no such advantage.

Long experiences with more than a thousand live audiences has also taught me that one simple demonstration is usually more productive than a dozen attempted explanations. As they say . . . “Seeing is believing,”

But, in my opinion, by far the best way to communicate a new idea is provided when it is possible for the members of the audience to experience just what you are trying to tell them about. And, again, this is an approach to communication that is not available to a writer.

The illustrations that I have used in preceding chapters, and will use in this chapter and in following chapters, are intended to communicate information that is sometimes difficult to explain to people who are not truly familiar with the subject. For the last several years I have been one of the principle speakers during medical seminars conducted by the School of Medicine of the University of Florida, Gainesville, and while I cannot be sure just how much, if anything, the people who attended these seminars actually learned, I do know one thing for sure: I, at least, have learned a great deal from these seminars, have primarily learned how to communicate with a live audience, have learned things to do and things to avoid.

One thing that a speaker must avoid like the plague is the use of illustrations that the audience does not understand; once having confused an audience you have probably lost them for good. And never forget that many people can never bring themselves to admit that they are confused.

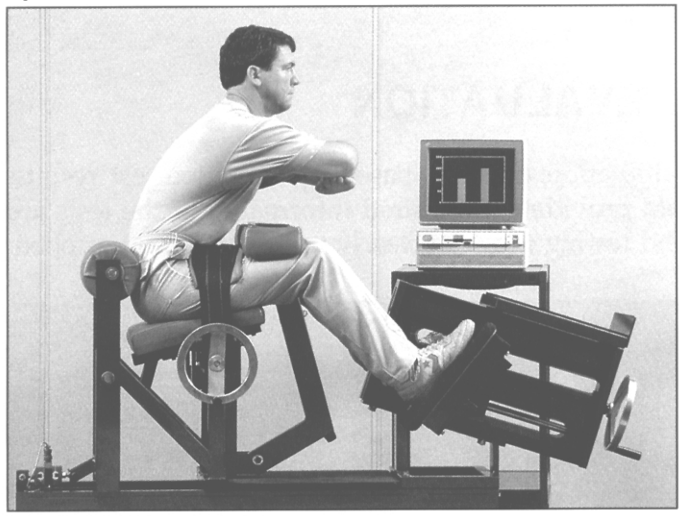
Another problem facing a speaker results from the fact that very few people in the audience have a truly open mind, since most people have very firm opinions based upon myths and superstitions and may become very disturbed if the speaker’s statements contradict their beliefs. You cannot convince an audience if they believe you are insulting them.

One speaker that I have heard many times leaves most of the members of an audience with the impression that he does not believe his own statements; which, of course, is the kiss of death . . . after all, if he does not believe what he is saying, then why should they believe him? An audience, or a jury, will believe you if they like you, but will not like you if they do not trust you. The facts be damned, most people respond primarily as a result of their emotions.

Fortunately, a speaker addressing a live audience has a great deal more latitude than a witness does in court; but he should always remember that telling people the truth frequently means that he is addressing a hostile audience, consisting largely of people who have already made up their minds.

Since a majority of the widely-accepted theories in the fields of exercise physiology and physical rehabilitation are simply wrong, totally invalid, it follows that the members of an audience, when first exposed to the facts, may not believe anything that they hear that contradicts their opinions.

fig. 1



A writer has all of the same problems that a speaker does, and almost none of the advantages. Do the readers understand that statement? Maybe. Have I insulted some of the readers? Probably. Have I communicated clearly enough for the readers to utilize this knowledge in practical applications? Sometimes, but certainly not always.

The so-called War on Drugs should have taught us that "Just say no" has accomplished very little; apparently most people cannot, or will not, learn from the mistakes of other people, and do not always learn even from their own mistakes.

But having learned a great deal from my own mistakes, and sometimes even from the mistakes of other people, I have tried to apply this knowledge during my attempts to communicate with an audience, and am now trying to communicate with as many readers as possible. Since quite a lot of what an audience will be told is based upon charts similar to those that I am using in this book, I have learned that it helps a great deal if the audience understands just how those charts were produced; so now I always start my presentations by demonstrating actual tests, using some of our own people as subjects during these test procedures. As a test procedure is being conducted the audience can see the results of the test displayed on a very large computer monitor. The following illustrations in this chapter are intended to explain these test procedures to my readers.

The machine shown in figure 1 is neither a testing machine nor an exercise machine; it was designed and built for an entirely different purpose: the demonstration that we conduct while using this machine could be conducted with a clinical model of the MedX Lumbar-extension machine if we had an audience of only two or three people, but most of the people in a larger audience could not see what was happening if we used a clinical machine, so this machine was created in order to solve that problem.

This machine has only the parts that are required to anchor the pelvis in order to isolate the lumbar spine, which is the first requirement for a meaningful testing procedure intended to measure the strength and range of movement of the lumbar spine. If the pelvis can move while you are extending your lumbar spine, then it will move, and it then becomes impossible to determine just which part of the total range of movement was produced by pelvic movement and which part was produced by lumbar-spinal movement. And secondly, it is also impossible to determine just how much of the measured level of strength was produced by the muscles that move the pelvis. Such a compound movement, a movement involving more than one joint, cannot be tested in a meaningful manner.

It took us fourteen years of continuous research and development to determine, and provide, the actual requirements for meaningful testing procedures, none of which requirements were obvious to us in advance, and many of which are still not even suspected by most members of the scientific community. So now, in this book, I am faced with the problem of trying to clearly explain several things that most readers never heard of before; some of which things may directly contradict their firmly-believed opinions.

In the end, we were successful only after we realized that we had to incorporate the femurs, the large bones of the thighs, into the testing machine. Actually use the femurs as part of the machine. The femurs extend from your knees to your pelvic/hip sockets, which means that if your pelvis moves then your knees will also move; thus, if we could prevent any movement of the knees, we were also preventing movement of the pelvis. And once we clearly understood this relationship, it was relatively easy to provide a solution for the problem of unwanted pelvic movement.

fig. 2

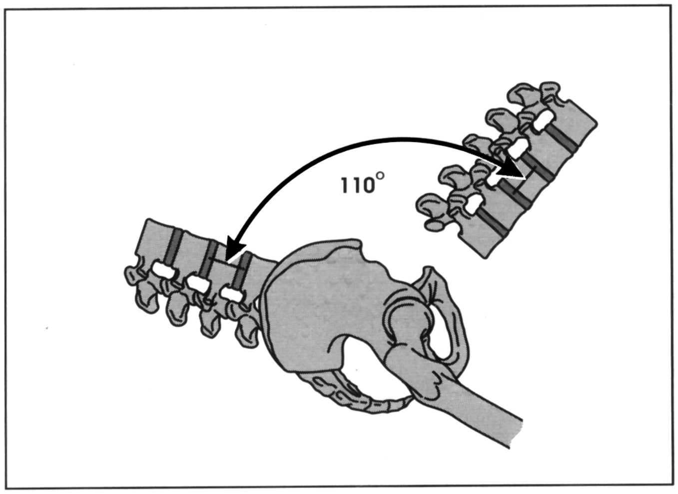


fig. 3

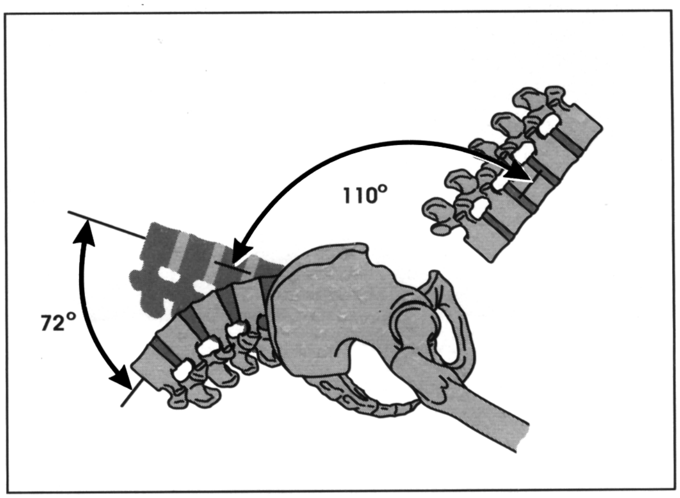
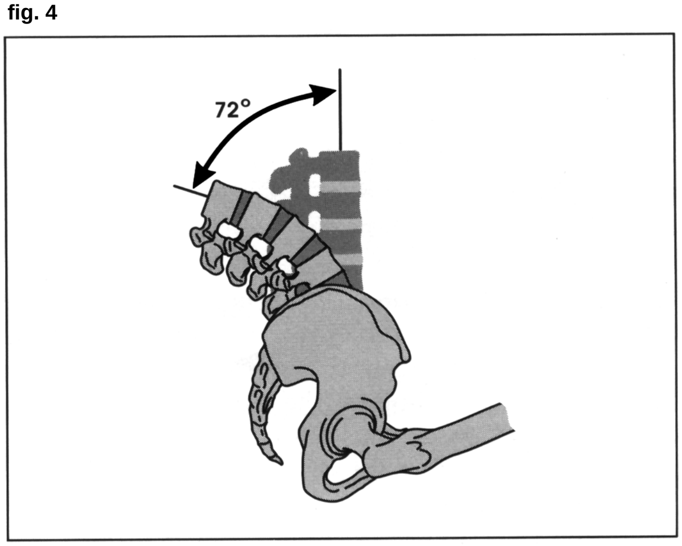


fig. 4



In the MedX Lumbar-extension machine, and in this demonstration-only machine, the pelvis is anchored in such a way that it cannot rotate around the axis points of the pelvic/hip sockets, cannot move in the direction of extension. We are not concerned with any forward movement of the top of the pelvis, because there is no tendency for the pelvis to move in that direction since all of the involved forces are trying to move the pelvis in an opposite direction. During a test in such a machine, the muscles of the hips, the gluteus muscles of the buttocks and the hamstring muscles of the thighs, will attempt to rotate the pelvis in the direction of extension, but rather than causing a problem any force produced by these muscles actually helps to prevent any pelvic movement. Force from these hip muscles pushes the pelvis more solidly against the round pelvic-restraint pad and thus prevents pelvic movement rather than causing it.

When a subject is properly restrained in this machine the pelvis and the pelvic/restraint pad have a relationship that is identical to that of two gears that are connected by their teeth; if one gear rotates then the other gear must also rotate. In the MedX machine, if the pelvis rotates only one degree then the pelvic-restraint pad will rotate more than two degrees; but if the pelvic-restraint pad does not move at all during any part of a full-range lumbar-extension movement by the subject being tested, then you can be certain that the pelvis is not moving; which means that the subject is producing totally isolated movement of the lumbar spine. And just how much movement of the pelvic-restraint pad is acceptable? NONE.

With a subject seated in the machine in the manner shown in the above illustration, a force of 100 pounds imposed against the bottom of the feet becomes a force of slightly more than 210 pounds imposed upon the pelvic/hip sockets; 70 pounds of force pushing the femurs towards the rear and 140 pounds holding the pelvis down. The vertical force holding the pelvis down results from the fact that the heavy belt across the top of the thighs becomes a fulcrum which converts 70 pounds of force pushing the knees upwards into 140 pounds of force pushing the pelvic/hip sockets down.

There is an old expression that states . . . "There is no free lunch." Which means that you cannot get something for nothing, and cannot get out more than you put in. Which is true when you are talking about mechanical work, but is not true if you are talking about force. Remember what Archimedes said . . . "Give me a long enough lever, and a place to stand, and I can move the Earth."

Given a lever that is eleven feet long, with a fulcrum that is located only a foot away from one end, a downwards force of one pound imposed on the long end of the lever becomes an upwards force of ten pounds coming from the short end of the lever. In the MedX Lumbar-extension machine a force of 100 pounds imposed upon the bottom of the feet at a relative angle of 45 degrees from the midline on the femurs produces forces acting in two directions at the knee, a force of 70.7 pounds pushing the femurs straight back towards the pelvic/hip sockets and an equal force pushing the knees up, perpendicular to the midline of the femurs; and since the distance from the knee to the middle of the heavy belt across the upper thighs is twice as long as the distance from the middle of the belt to the pelvic/hip sockets, the upwards force of 70.7 pounds acting upon the knees becomes a downwards force of 141.4 pounds pushing the pelvic/hip sockets downwards.

An opinion? No, a simple fact of very basic physics.

While using this demonstration-only machine in front of a live audience, we initially have the subject in the machine go through a full range of movement. But have them do so before they are properly restrained in the machine: the unavoidable result being that their pelvis will move, and the audience can see that the pelvic-restraint pad is also rotating.

Then the subject is properly restrained in the machine, after which a full range of lumbar-spinal movement can be performed with no slightest movement of the pelvic-restraint pad. Thereby proving that we have provided totally isolated movement of the lumbar spine. All of which, of course, is carefully explained to the audience while the demonstration is being conducted.

The following three illustrations show the three distinct manners which can be used for extending the lumbar spine: ONE, rotating the pelvis to the rear around the axis points of the pelvic/hip sockets; TWO, moving both the pelvis and the lumbar spine, a compound movement; THREE, totally isolated lumbar-spinal movement.

Figure 2: Back extension can be performed in three distinct fashions; this figure illustrates back extension that involves only hip function. The pelvis moves as a result of the hip and thigh muscles, but the lumbar spine does not change its position in relation to the pelvis. Testing in this fashion tells nothing about the strength of the spinal muscles; and exercise performed in this fashion will not increase the strength of spinal muscles. Both testing and exercise procedures performed in this manner are dangerous; because the spine has reached its limit of movement in the direction of flexion, and any force imposed in that posture will tend to move the spine beyond its limit of movement.

Figure 3: During the type of movement illustrated here, the pelvis moves as a result of the hip and thigh muscles, while the lumbar spine moves as a result of the spinal muscles. Testing this compound function tells nothing of value about the strength of the lumbar muscles, and exercise performed in this manner has little or no effect upon the spinal muscles. Such exercise will increase the strength of the hip and thigh muscles, while leaving the spinal muscles in a continuing state of atrophied weakness.

Figure 4: Meaningful testing or productive exercise must be performed as shown here; the pelvis must not move, and if properly restrained will not move. Isolated lumbar function.

Having completed the demonstration covered above, I then tell the audience that a therapist conducting a testing procedure, or supervising an exercise session, in a clinical model of the lumbar-extension machine can see the pelvic-restraint pad and will instantly be aware of the situation if the pad starts to move; if the pad does move during any part of a procedure, then the therapist should increase the force imposed against the feet and tighten the heavy belt over the upper thighs.

Having completed the above demonstration, I then turn the audience over to another speaker; this second speaker will then conduct another demonstration, this time using a clinical model of the lumbar-extension machine while performing a three-part testing and exercise session called a "fatigue response" test.

fig. 5

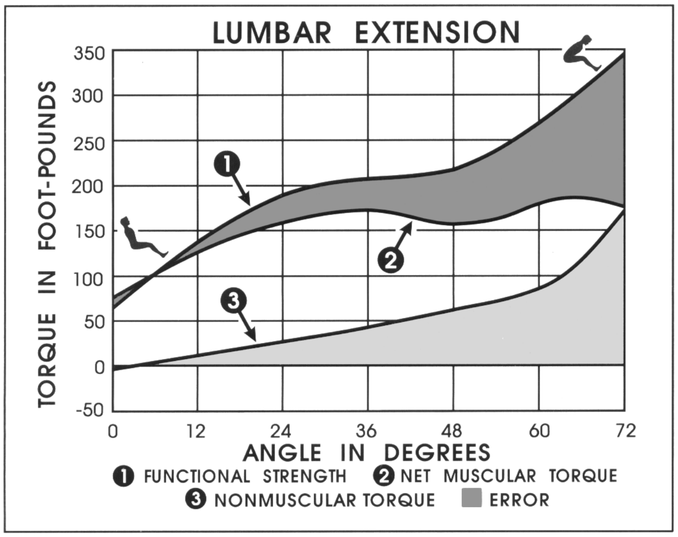
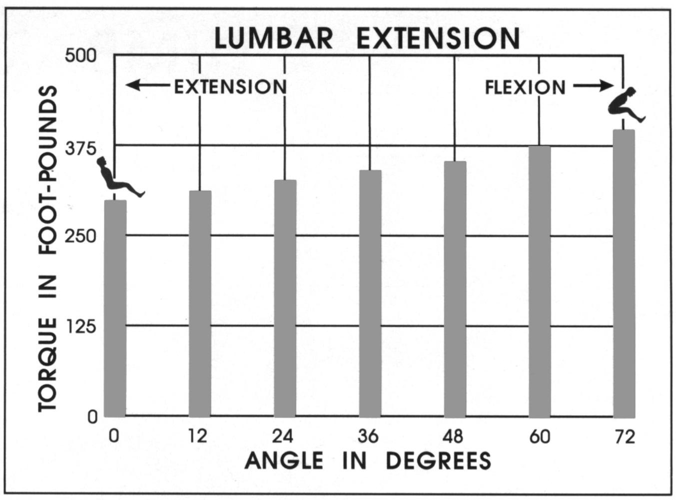


fig. 6



Step by step the second speaker will tell the audience exactly what they are doing, and why they are doing it; will explain and demonstrate everything that is required to restrain the test subject in the machine, will then adjust the counterweight that is required to compensate for nonmuscular torque produced by the force of gravity acting upon the mass of the subject's torso, head and arms, and will then move the subject forward into the flexed position of the lumbar spine.

Throughout this demonstration the machine is feeding the test results to three different computer monitors, two of which monitors are parts of the machine, one for the therapist and one for the subject, and a third monitor that is very large and is situated so that the audience can see the test results as they are being measured.

Assuming that the subject has a full range of normal movement, strength tests will be conducted in seven different positions, in increments of 12 degree throughout a total range of 72 degrees in order to establish the subject's level of fresh strength.

Having moved forward into the flexed position, the subject will relax, then producing no force of muscular contraction; nevertheless, even with the subject relaxed, the monitor will show a bar graph which demonstrates that torque is being produced, torque that is produced by stored energy and that will be recorded by the computer. Having recorded the nonmuscular torque, the subject will then be instructed to start producing additional torque from the force of muscular contraction; will be told to produce as much torque as possible, but to do so gradually. As the subject attempts to extend his lumbar spine, the bar graph on the monitor will gradually move upwards, always showing the level of total torque that is being produced; having produced as much torque as possible from the force of muscular contraction, the subject will then slowly relax. Force is never produced suddenly, and having produced as much force as possible the subject should not relax suddenly.

Figure 5: The maximum level of measured torque is functional strength in that position. When nonmuscular torque is subtracted, the remainder is the true level of muscular strength: torque actually produced by the force of muscular contraction, Net Muscular Torque, NMT, muscular strength unbiased by any source of nonmuscular torque.

With static testing, the artifacts inherent with all dynamic testing procedures are avoided.

Figure 6: Having performed tests in several positions throughout a full range of movement, the monitor shows a bar graph of torque in each position. A normal ratio of functional strength would show the highest level of torque in the flexed position and the lowest level in the extended position, with proportionate levels in intermediate positions.

fig. 7

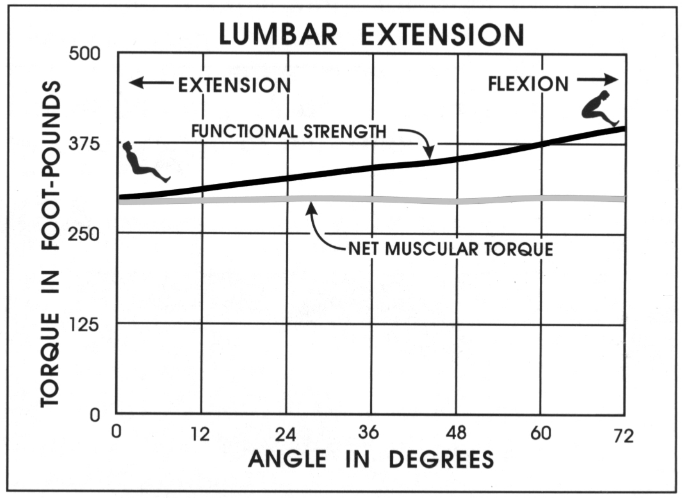


fig. 8

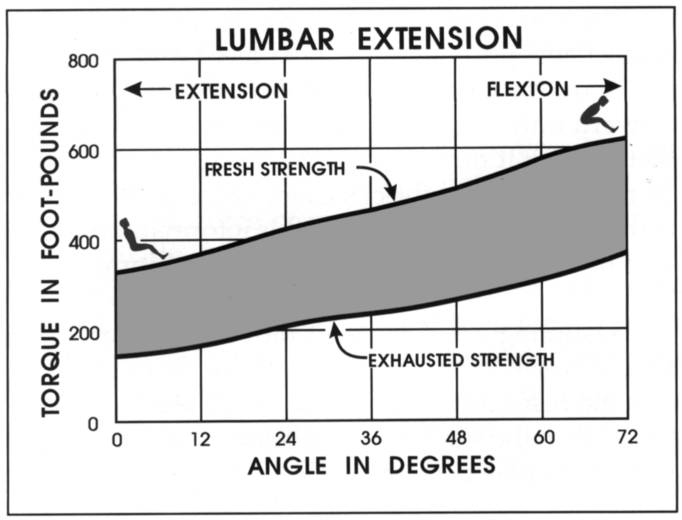


Figure 7: Based upon the torque measured in several positions, the computer will interpolate strength throughout the full range of movement; and the monitor will then show, and the printer will print, 2 distinct strength curves. The black curve shown on the monitor is the full-range level of functional strength, expressed in foot-pounds (or Newton Meters) of torque and correlated with positional measurements; while the grey curve shows true muscular strength, NMT.

After the fresh level of strength is measured the subject will then be exercised, will perform as many full-range repetitions as possible while using an appropriate level of resistance; the level of resistance for the exercise is determined by the subject's fresh strength, and we have found that resistance equal to fifty percent of the peak torque measured during the strength test is suitable for most subjects. Given that level of resistance for the exercise, most subjects, those with a usual mixture of fiber types in their lumbar muscles, will be able to perform about ten full-range repetitions of the exercise.

But subjects with a high percentage of fast-twitch fibers in their muscles may be able to perform only four or five repetitions of the exercise, while subjects with a high percentage of slow-twitch fiber may be able to continue the exercise for twenty-five or thirty repetitions

Immediately after the exercise, the subject will be tested in order to determine his remaining level of strength; this second strength test being identical to the first test.

Figure 8: When the procedure is conducted for determination of fatigue characteristics (muscular fiber type), the monitor will display and the printer will print both pre-exercise and post-exercise strength curves, together with all of the raw data produced during both tests. Based upon the level of resulting fatigue, compared to the amount of exercise performed during the procedure, the computer will print a hard copy of the significant results produced by the tests; together with suggestions in regard to the frequency and extent of exercise considered best for a subject with similar characteristics.

Members of the audience, having seen exactly how a strength test is conducted, will then have a better understanding of charts that are used by following speakers during the seminar.