BACK IN Shape

With his new Lumbar Extension Machine, Nautilus equipment inventor Arthur Jones exercises his physical fitness expertise.

If you want to see Arthur Jones at his animated best, ask him a question about inventing physical fitness equipment.

First, the pacesetting inventor created Nautilus exercise equipment. He has since developed the Lumbar Extension Machine, which has the ability to double lower back strength in as little as 10 weeks, according to tests conducted at the University of Florida's Center for Exercise Science.

UF professor Michael Pollock leads the research of the Lumbar Extension Machine, invented by Arthur Jones (inset).

Jones is no stranger to bold steps in exercise machinery; his Nautilus equipment revolutionized the fitness industry and spawned a generation of exercise enthusiasts who huffed and puffed their bodies to physical fitness. In fact, the term "Nautilus" has become so entrenched in America's exercise vocabulary, it is often used to describe any multi-station weight-lifting apparatus.

But physical fitness is not the only area in which Jones is producing bold results. He has also increased the pace of the University's $200 million

(Continued)

Walter Coker

capital campaign — the first comprehensive, University-wide fundraising effort in UF history — scheduled to officially begin this fall.

In May, Jones announced he is giving UF $8.47 million, the largest gift ever made to a public university in Florida. His donation will be shared by UF's Health Science Center and the Center for Exercise Science, where researchers are studying the medical and physiological effects of exercise. The exercise center is operated by the Colleges of Medicine and Health and Human Performance.

"Arthur Jones has a reputation as a man who gets things done and never does anything halfway," UF President Marshall Criser says. "As beneficiary of the largest gift in the history of the University of Florida and our state university system, we welcome the opportunity to join in his crusade against lower back problems."

One of the exercise center's projects involves testing Jones' Lumbar Extension Machine, designed to evaluate and rehabilitate lower back muscles.

"I have a long-standing interest in physical training and wellness, and my support of the University of Florida will boost the research of lower back pain, one of man's most nagging problems," says Jones, who sold his Nautilus empire in 1986 to devote his energy to his Ocala-based MedX Corporation, which began marketing the Lumbar Extension Machine later that year. "Back problems cause more pain, more loss of work and greater medical costs than any other physical problem."

To address those problems, the exercise center's share of Jones' gift will support the research of Dr. Michael Pollock, the center's director. The Health Center's share will help pay for a new academic research building now under construction. The $39 million building, due for completion by summer 1989, will relieve the Health Center's shortage of laboratory and office space, one of its most crucial needs.

Pollock says the lumbar machine could save up to $40 billion a year in costs directly and indirectly related to the common American affliction of lower back pain.

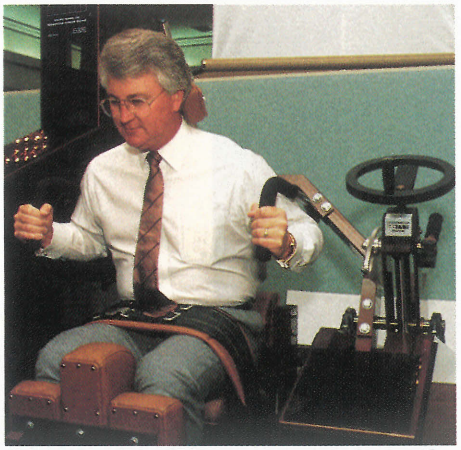
A professor in both the College of Medicine and the College of Health and Human Performance, Pollock has been conducting clinical tests to check the ability of Jones' Lumbar Extension Machine to accurately evaluate and strengthen the lower back muscles. Jones says the lumbar machine is the first to truly isolate and measure the strength of the lower back.

Pollock's preliminary studies revealed some startling results: the lumbar machine more than doubled the lower back muscle strength in people who trained on the machine once a week for 10 weeks.

"It was like these muscles had never been trained," says Pollock, even though most of the 15 participants were physically active and at least half had been regularly working out on Nautilus equipment, including back machines.

People with chronic pain in the lower back became stronger and experienced less discomfort after working out on the machine, Pollock and a team of researchers found.

The machine, which has been featured in *Business Week* and other national publications, is a padded chair surrounded by an assortment of pads, levers, belts, weights and a computer monitor. Two of its key features, however, are straps anchoring the thighs of the person in the chair and a strategically placed bar that presses against the shins to restrict upper-leg movement. Restricting movement of the torso enables the high-tech machine to isolate the muscles of the lower back.



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Florida Lt. Gov. Bobby Brantley tried the Lumbar Extension Machine at a press conference announcing Jones' gift.

Pollock, former president and a lifetime member of the American College of Sports Medicine, says, "Finding a way to isolate the muscles of the lower back for testing and strengthening can potentially help millions of back pain sufferers and save billions of dollars in lost work days and insurance claims due to back injury."

The lumbar muscles of the lower back are susceptible to injury because they are rarely used and not trained by normal exercise routines. The machine stabilizes the pelvis so the larger buttock and leg muscles are eliminated as the primary movers. Unless the pelvis is restrained, Pollock says, the buttock muscles, backs of the legs and hamstring muscles usually do the work — not the small, weaker lumbar muscles.

Pollock believes the strength of the lower back muscles improved by 200-300 percent in 10 weeks in the one study because they had atrophied from disuse.

A person using the machine sits upright in a chair, while several pads and belts exert pressure on the thighs and hips to prevent them from moving.

Pollock believes one application for the center's research has great potential for reducing athletic injuries. "If strength is a factor in preventing injury — which has been shown in other joints — and if we can double the strength in the lower back, I think it's got to help prevent some injuries," he says.

Elderly women who suffer from osteoporosis are another group that stands to benefit from research. Resistance exercise improves strength and also helps to increase the bone density and decrease the risk of injury, Pollock says.

Next, Pollock plans to test dental students and work with vocational and occupational rehabilitation specialists. Dentists have one of the highest incidences of back problems because they do a lot of bending and reaching in their work, which places stress on the back, he says.

Looking toward the future, Pollock sees bright possibilities for the Lumbar Extension Machine.

"Because of Arthur Jones' inventiveness and his donation," he says, "the University of Florida will have a part in revolutionizing the field of lower back therapy and fitness." UF

New Approach to Low Back Evaluation and Training

Michael L. Pollock, PhD, Director
James E. Graves, PhD, Research Associate
Center for Exercise Science, University of Florida

Low back pain is one of the most common and costly medical problems in modern society. It has been estimated that eight out of ten people will suffer from low back pain at one time or another in their lives. Cost of medical care and loss of job time is estimated to be in the billions of dollars annually. Insufficient strength in the lumbar musculature is one of the major factors related to the development of low back pain.

Accurate assessment of lumbar strength requires: stabilization of the pelvis to isolate the lumbar extensor muscles and minimize the contribution from the hip and leg muscles; measurement through a full range-of-motion; and, standardization of the testing position and correction for the influence of gravitational forces (body weight) during testing.

If the pelvis is free to move during lumbar extension, the pelvis will rotate as the hamstring and gluteus muscles contract. The effective assessment and training of the lumbar muscles requires stabilization of the pelvis to isolate the lumbar extensor muscles and minimize the contribution of the hip and leg muscles.

A new lumbar extension machine (MedX™, Ocala, FL) has recently been developed for the purpose of accurately measuring full range-of-motion lumbar extension strength. The machine is designed to stabilize the pelvis and standardize positioning of the upper body, thus allowing for more precise measurement and training of the smaller and weaker lumbar extensor muscles.

Figure 1.
Restraining mechanisms of the MedX™ (Ocala, FL) lumbar extension machine.

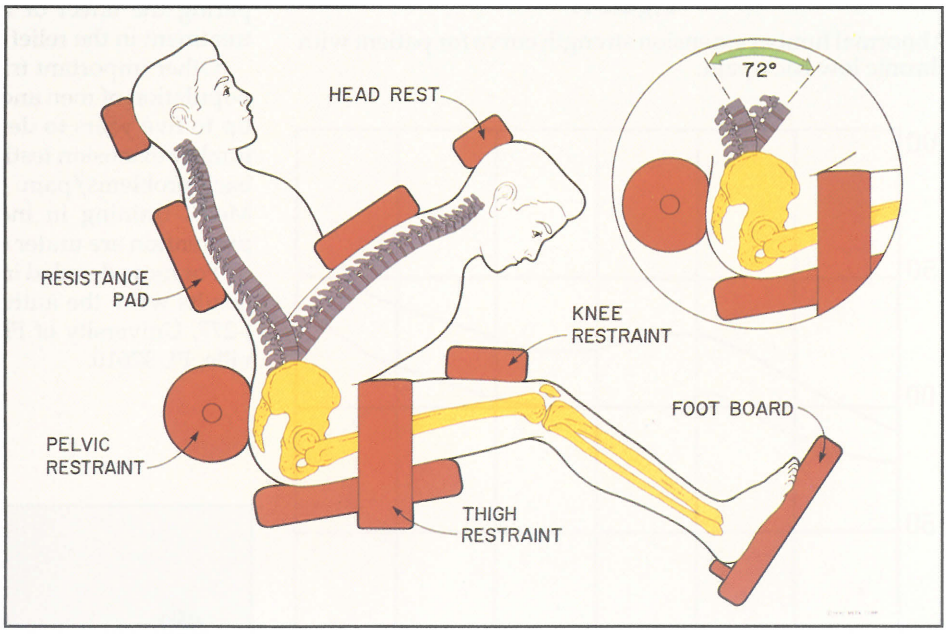

Figure 1 shows a diagrammatic view of the restraint system specifically designed to isolate the lumbar extension function. The footboard is adjustable and pushes the femurs back into the pelvis which is resting against the lumbar restraint pad. The femur and thigh restraints are tightened to prevent any vertical movement of the thighs or pelvis. The machine also standardizes the involvement of the head, arms and trunk. Prior to testing or training the center line of the torso is counterbalanced to rule out its effect on the measurement of strength.

Lumbar extension function is evaluated by a three part test. First, maximum isometric strength is determined in seven positions through the subject's/patient's range-of-motion. The second phase of the test involves a dynamic exercise through the full range-of-motion. This work capacity test allows for the determination of dynamic strength and endurance. Usually 50 percent of peak isometric torque is used for this test. Once the dynamic portion of the test is completed (usually 6-20 repetitions) the isometric test is immediately repeated.

The strength tests allow the clinician to evaluate lumbar extension strength through the full range-of-motion. The normal lumbar extension strength curve is liner and descending from flexion to extension. (Figure 2).

Abnormal tests show weak musculature of the lumbar extensors, particularly in the later half of the range-of-motion (extension). Figure 3 shows an abnormal curve. This patient was weak throughout lumbar extension and has an abnormal weakness (dip) in the mid-range.

The work capacity test shows the fatigue characteristics of the musculature. Persons with predominantly fast twitch fibers often show strong lumbar extension muscles, but are fatigued greatly by the work capacity test. This would be shown by a 30-40 percent reduction in strength

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Figure 2.

Torque (N • m) measurements for isometric strength of the lumbar extensor muscles before (T_1) and after (T_2) a 10 week training program.

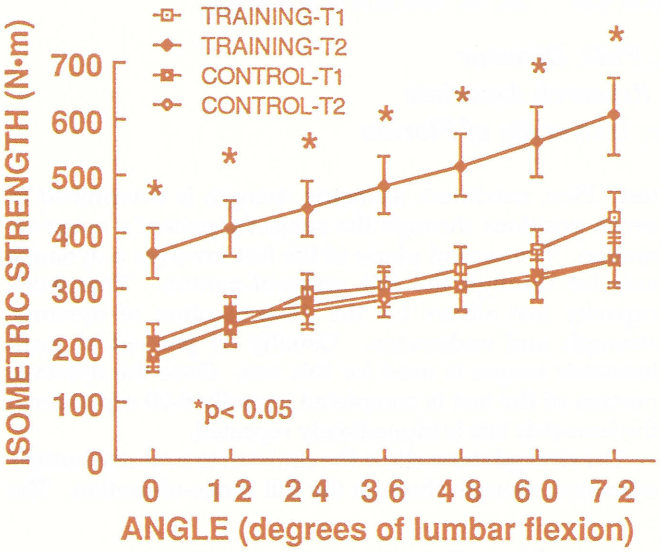
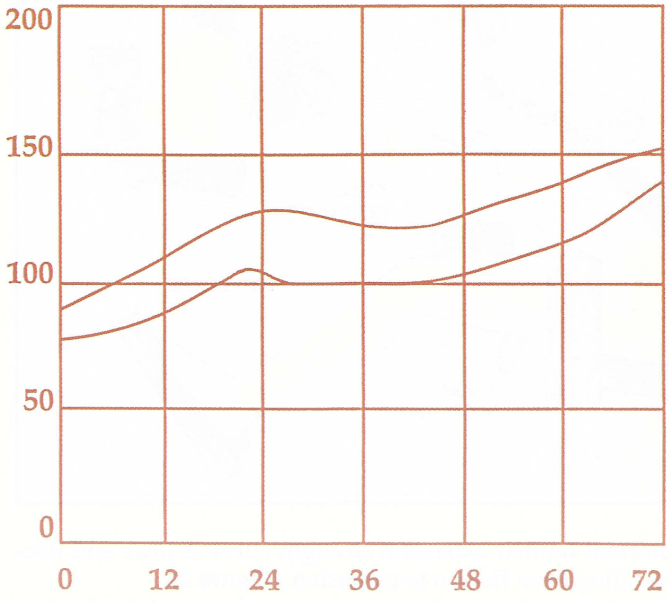


Figure 3.

Abnormal lumbar extension strength curve for patient with chronic low back pain.



following the work capacity test. Persons with a greater proportion of slow twitch fibers (endurance) will not fatigue greatly after the work capacity test. The data from the patient in Figure 3 shows a moderate amount of fatigue after the initial testing and the abnormality is duplicated on the repeat isometric test. It is felt that persons who fatigue rapidly in repetitive work tasks are more prone to back problems.

Since August 1987, the Center for Exercise Science, University of Florida, has been conducting independent research on the new lumbar extension machine. The project is funded by MedX. Our first project evaluated 136 man and women on multiple days and found the testing procedure and equipment to be extremely reproducible.

Figure 2 shows the results from our first training study. Fifteen subjects trained one time per week for 10 weeks and showed a 42 percent improvement in lumbar extension strength in the fully flexed position (72°) and 104 percent in extension. The control group did not improve.

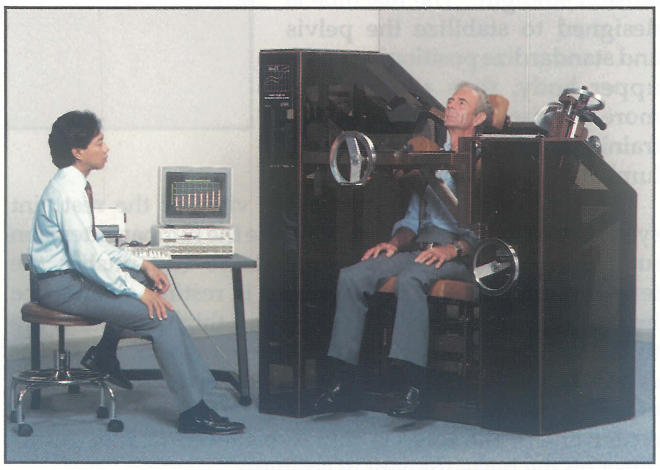
The abnormally large improvement in strength by the lumbar extensors is related to their initial state of weakness. Since these initial studies, another 300 men and women have been trained for up to 20 weeks with similar magnitudes of improvement. One of our most recent studies comparing the MedX with the result of 12 weeks of training on two machines that do not stabilize the pelvis showed no improvement in isolated lumbar function.

Preliminary results with patients have shown similar large improvements in lumbar extension strength and relief of symptoms. One professional golfer (from Florida) who was off the tour because of low back pain significantly increased his strength in 8 weeks. His symptoms subsided and he is back on the tour making money.

In regards to the patient population, a two-year, randomized, prospective study is currently underway comparing the effect of MedX training versus conventional treatment in the relief of chronic low back pain.

Other important trials include the evaluation of a large population of men and women who are being followed for up to five years to determine the effectiveness of isolated lumbar extension testing to predict future incidents of low back problems/pain. Projects determining the efficacy of MedX training in industry for the purpose of primary prevention are under discussion.

For more detailed information concerning these research results write the author at: Department of Medicine, Box J-277, University of Florida, College of Medicine, Gainesville, FL 32610.



MedX Cervical-extension Machine