

News

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***** New trunk tester measures back strength

DALLAS--Back pain -- the most costly disease problem in America today according to orthopedic surgeons -- has till recently been impossible to measure.

Now a new diagnostic and treatment tool that analyzes low back strength is providing for the first time objective data for documenting back injuries, screening athletes and evaluating effects of treatment.

A prototype isokinetic back/trunk machine by Cybex, one of only three in the country, is being used by researchers at The University of Texas Health Science Center at Dallas to measure the strength of back and trunk muscles. By determining the extent of injuries, the unit may prove invaluable in the legal resolution of personal injury and disability cases.

Researchers expect the unit to be marketed within a year.

"Back pain is the number one benign public health problem in terms of cost," says Dr. Tom Mayer, assistant clinical professor of Orthopedic Surgery. "It costs \$40 billion a year in workman's compensation, legal fees, social security, disability payments and medical fees."

Affecting some 12 million Americans, back problems cost the health care system more than coronary artery disease, hypertension or diabetes, according to Dr. Vert Mooney, professor and chairman of Orthopedic Surgery.

The new machine will identify those people whose back problems are due to muscle inadequacy versus other reasons. The same machine that evaluates injury can then be used to strengthen weak muscles or rehabilitate damaged ones. It can also objectively evaluate the progress of therapy.

"The applications are staggering," says Mayer. "It can tell young sports-minded individuals whether their strength matches athletic requirements. It will tell workers they can't take a certain job because it's not safe for them. It will point out correctable biological defects."

Sue Smith, assistant professor, Department of Physical Therapy, says the unit is not designed for acute back problems since pain limits one's ability to exercise with it.

The group has been collecting data the past year on a broad spectrum of people ranging from elite athletes (professional dancers and master swimmers) to severely injured patients. Normative data is needed to determine what is average strength for certain ages, weights and sex. They plan to present their findings at the International Lumbar Spine Society in Montreal this spring and will soon publish in the journal Spine, says Mooney.

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A large number of the chronic back pain patients Mayer is working with are industrial-injured patients. He says after four to six weeks of training on the trunk unit, patients may progress from severely deficient to adequate in trunk strength.

"The clinical goal of the project is to find better ways to treat people with back pain," says Mooney.

From a mechanical standpoint, analysis of low back function is much more complicated than analyzing function of the quadriceps as related to the knee, says Mooney. "You just test the knee strength and have a pretty clear understanding of what's going on. But in the back you have many muscles working together over several joints which can't be felt (as you can feel the knee or elbow). So previous analysis of back strength has been very vague because so many muscles participate."

Currently, Cybex is the standard by which all sports medicine people evaluate knees, ankles, legs and arms. It has been used for about 12 years for testing and training. Until now it has not been applied to the back.

The trunk unit is building on experience gained from the early ones used on knee problems. "This Cybex is appropriately equipped for the particular anatomical location we're testing," says Mooney.

Patient compliance is the key difference between treating athletes and typical chronic back pain patients. "Back pain problems are almost the flip side of sports medicine problems. In sports medicine, you work with highly motivated people who are just dying to get better. And you are actually trying to mold a program so they don't do any harm to themselves because they will do anything you tell them to do and they tear themselves up sometimes. So they are coached to get around their weak spots.

"Chronic back pain patients are seldom athletes. They are usually individuals who have been deconditioned, told to rest, stay off their feet and not do anything for months. It's a vicious circle. They don't do anything so they get weaker and then even minor things can aggravate them.

The unique aspect of the whole program here is the tremendous focus on objective evaluation of which the Cybex trunk unit is one component, says Mooney. It hasn't been an important theme in the past largely because there weren't the mechanisms to test objectively.

"In the past the only gauge to measure back pain was to ask the patient, 'How do you feel?' That's subjective evidence. Legally, this is a huge problem because these cases go to court and there may be a \$500,000 settlement riding on the question of 'Do you hurt or not?' There has never been a way to answer that question. This unit provides a great deal of objective evidence that is admissible in court. It's like an X-ray: it's either broken or it's not," the surgeon explains.

The Cybex device tests isokinetic strength by accommodating resistance against a lever moving at a set speed. It therefore measures dynamic strength at every point in the range of motion. At that rate, it measures the amount of muscle activity for each segment of that motion.

Smith says those who have suffered back pain for extended periods of time exhibit weakness at faster test speeds. Findings show that in most normal people flexor (belly) muscles are usually weaker than extensor (back) muscles. Frequently, the reverse is found in back pain patients. Researchers can predict which muscle group can be improved with strengthening exercises based on how they test on the trunk tester.

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"It is so difficult to fake this machine because you don't know what it's testing. You can set it so there's no resistance at all so that a two-year-old kid could move it. So if an adult can't move it there's some objective evidence they are not functioning normally.

"Even people in pain move in a certain way that can be displayed graphically so we can identify very clearly specific weaknesses, know how to strengthen and identify the rate of improvement," Mooney explains.

Another phase of the program here is measurement of electrical activity of muscles to evaluate their fatigue. It has been shown that the rate at which fatiguing muscles fire becomes less and less. Using statistical analysis of this data, researchers can predict how fast muscles are going to fatigue. This work is being done with a grant from the Veterans Administration.

Rehabilitation with the Cybex trunk unit may eventually supplement previously used back pain remedies such as ultrasound or hot packs. These treatments may be useful in acute stages but do nothing to restore strength, says Smith.

"None of those gadgets affects function. Like a hot shower they make you feel better for a short time. To the extent they allow the individual to exercise they are useful but as an end in themselves, they do nothing," says Mooney. "They don't affect the disease in any shape or form."

The only way to affect disease, explains the physician, is by making the connective tissue work to improve itself with graduated, appropriate exercises. Then two things can change -- strength and range.

"Treatment goals are to return the back joint to the normal range, return muscle function so it will resist fatigue and find ways to diminish pain while the individual is participating in those two projects," says Mooney.

Volunteers who are interested in having their trunk strengths measured are needed for a control group. For information call Sue Smith at ext. 2850.

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