

*Non Invasive Procedures  
For Patients With Chronic  
Lower Back Pain*

# Scientific Review

William Squires, PhD  
Tom Dunn, P.T.  
Tinker Murray, PhD  
John Boren, D.C.  
James Eldridge, PhD  
Carlos Ganuza, M.D.

**L**ow back pain can have many causes. According to the CDC low back pain is experienced in 86% of the population. In 95% of the low back pain population the pain can be attributed to a breakdown of the structural integrity of the muscles that support the lumbar spine. This loss of muscle strength is termed disuse atrophy. The American Medical Association estimates that back injuries account for almost 20% of all injuries and illness in the workplace.

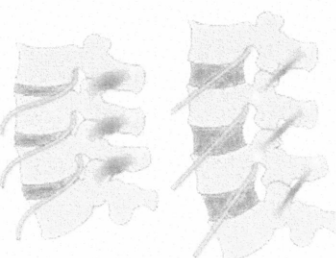


From the "Biomedical Results of Skylab" published in 1977 it was reported that the astronaut crew actually grew in stature on return from flight. The observed change in height was attributed to "a reduced load on the spine and an expansion of the intervertebral discs" pg.335. Subjective statements by crew confirmed that their low backs actually felt better. In preparation for the next space station a series of shuttle flights began in the early 1990's called the extended duration orbiter or EDO missions. These flights were designed to take crewmembers into space for up to nine days and to study the effects of long-term micro-gravity exposure to a variety of physiological systems. One system that was found to change significantly was back strength. Some of the subjects studied reported up to 20% decrease in lower back strength.

The figure below depicts the unloaded spine following micro gravity.

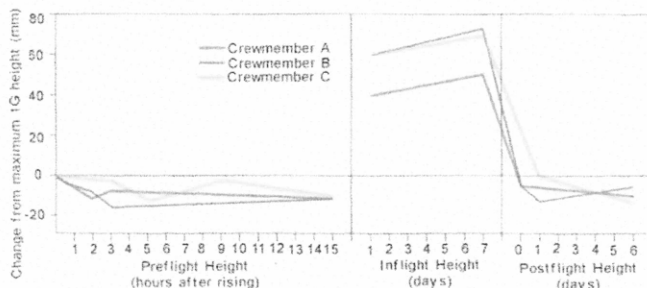
Figure 9. (a) As the intervertebral distance increases in micro gravity, the muscles, ligaments, and/or nerves are stretched and can cause pain. (b) Space flight data has confirmed that lengthening and straightening of the spine occurs during exposure to micro gravity.

Figure 9.(a)



Human Physiology in Space (NASA Publication).

Figure 9.(b)



Lordex Corporation, a Houston based medical company, immediately saw the clinical applications related to these findings. On the advice of their clinical scientific advisory board Lordex began the development of the first prototype Lumbar Extension machine, grandfather of the current RX1. An independent grant was given to Tinker Murray PhD Director of the Exercise Science Lab at Southwest Texas State University. LEM testing involving the computerized evaluation of flexion (eccentric) and extension (concentric) strength measurement was found to be highly reliable across groups studied. The term Cumulative Strength Index (CSI) was first used to quantify back strength. The validity of the machine was documented by another study in the same laboratory using EMG technology specifically measuring the Erector Spinae muscle group. This validity study was done by Diane Byerly, PhD during her dissertation at the Department of Aerospace Engineering at the University of Colorado Boulder. Additionally, Dr. Byerly published her findings while at NASA in the Journal of Aviation Space and Environmental Medicine. The two major questions posed by the scientific advisory board. (1). Was the unit reliable? Did it measure the same variable time after time? And (2). Did the unit measure the correct muscle group deficiencies? The report indicated that the EMG studies were repeatable, and valid. Secondly, the muscle strength deficiencies in CSI were significantly improved.

Lordex Corporation, having shown the value of a strength restoration procedure, shifted research focus to the issue of gravitational

compression of the lumbar spine. The Lordex Decompression unit was then developed and pilot tested at the University of Texas (Permian Basin). Testing in the Applied Exercise Physiology Lab under the direction of Dr. James Eldridge was designed to compare lumbar decompression vs. standard physical therapy as a means to decrease non-specific back pain. The researchers found "... that the therapeutic modality of lumbar decompression using the LDU followed by lumbar extensions exercises using the Lordex RX1 not only decreased the perceptual pain indices of the subjects but, also alleviated pain to the point that subject reported the completed absence of pain."

The next question posed by Scientific Advisory Board (SAB) to the Lordex Corp was how the procedure, Lumbar Decompression Therapy and Strength Restoration Therapy, impacted the change in patient's perceived pain following a standard prescribed in-office protocol. Amy Bohman, PhD a Research Psychologist, found a 91.7 percent reduction in self-reported pain following the Lordex Decompression (LDT) and Strength Restoration (SRT) Therapy program, independently analyzed the data produced in this Clinical Study.

This type of valid research described above and independent quality control has been lacking in this growing industry. The Lordex Scientific Advisory Board has been together for over 20 years to investigate, research and develop testing methods to evaluate the efficacy of non-invasive methods to treat low back pain.

## References

Biomedical Results of Skylab: Eds RSJohnson and LF Dietlein, Scientific and Technical Information Office, NASA, Washington DC, 1977.

Human Physiology in Space: Eds: BFLuan and RJ White NASA Washington DC pg. 1994.

Evaluation of Isometric Lumbar Extension Strength in Healthy Men and Women. Masters Thesis Brian Sekula, Southwest Texas State University, San Marcos, Texas 1991, Advisors TD Murray and WG Squires.

Reliability of Testing Lumbar Extensor Muscles Isometrically, Master Thesis Art Shuler, Southwest Texas State University, San Marcos Texas, Advisors TD Murray and WG Squires. (Also presented at the American College of Sports Medicine, Texas Chapter .)

A Statistical Model for Predicting Muscle Performance. Diane Byerly Doctor of Philosophy Thesis, The University of Colorado at Boulder, Department of Aerospace Engineering Sciences 2000 Advisor WG Squires.

Prediction of Muscle Performance During Dynamic Repetitive Movement. DL Byerly, KA Byerly, MA Sognier and WG Squires, Aviation Space and Environment Medicine. Vol 74, No.1 Jan 2003 pgs 69-72

Comparison Between Lumbar Decompression Therapy and Standard Physical Therapy as a Means to Decrease Non-Specific Low back Pain. JA Eldridge, G Nelson, D Barnett and WG Squires. Lordex Technical Report Presented to the American College of Sports Medicine, Texas Chapter 1999. Submitted for publication, The Spine Journal.

A Retrospective Analysis of Self Report Non Specific Back Pain before and After Lumbar Decompression Therapy followed by Back Strengthening. A Bowman, J Boren and WG Squires. Lordex Technical Report Submitted for publication 2005.