

MedX Published Research

SURGERY PREVENTION & PROVEN EFFECTIVENESS

Can Spinal Surgery Be Prevented by Aggressive Strengthening Exercise? A Prospective Study of Cervical and Lumbar Patients

Archives of Physical Medicine & Rehabilitation

January 1999 Volume 80, Number 1

Brian W. Nelson, MD, David M. Carpenter, MS, Thomas E. Dreisinger, PhD., Michelle Mitchell, PTA, Charles E. Kelly, MD, Joseph A Wegner, MD

Study Outcomes & Clinical Relevance: *Forty-six of the 60 participants completed the program. At an average of 16 months after completion, 38 patients were available for follow-up while 8 patients could not be located or contacted. Of these 38 patients only three required surgery after completing the program.*

In other words, patients who were informed they required back or neck surgery had a 92% chance of avoiding surgery with aggressive spinal strengthening on the MedX Medical Machines.

Can Exercise Therapy Improve the Outcome of Microdiscectomy?

Spine

June 2000 Volume 15, Number 25

Dolan P, Greenfield K, Nelson RJ, Nelson IW
Department of Anatomy, University of Bristol, United Kingdom

Study Outcomes & Clinical Relevance: *A 4-week postoperative exercise program can improve pain, disability, and spinal function in patients who undergo microdiscectomy. : A brief course of active-based therapy provided long-term (up to one year) benefits to patients following microdiscectomy. These exercise-induced benefits augmented the outcomes provided by surgery. The authors expound on the long-term deconditioning that likely precedes surgery. A follow up study should thus include a presurgical exercise group. If properly applied, aggressive spinal strengthening performed pre-surgically may have not only improved surgical outcomes, but helped many patients avoid surgery altogether—as previous research has suggested.*

The Clinical Effects of Intensive Specific Exercise on Chronic Low Back Pain: A Controlled Study of 895 Consecutive Patients With 1-Year Follow Up

Orthopedics

October 1995 Volume 18, Number 10

Brian W. Nelson, MD, Elizabeth O'Reilly, RN, Mark Miller, PT, Mike Hogan, PT, Charles E. Kelly, MD, Joseph A Wegner, MD
Physicians Neck and Back Clinics, Minneapolis, Minnesota

Study Outcomes & Clinical Relevance:

- 76 percent had good or excellent results
- Patients with either radicular or referred leg pain (over half of all patients) responded just as well as patients with isolated low back pain

- *Prior to evaluation at PNBC, patients had seen on average three physicians and had failed six different treatment options, including chiropractic, epidural injections, facet injections, ultrasound, traction, medication, and electrical stimulation.*
- *Results were independent of diagnosis. Spinal fitness was crucial, regardless of underlying condition.*
- *Patients completing the PNBC program had dramatically less (67 percent) medical reutilization in the year after discharge than comparable control group patients treated elsewhere with passive modalities.*

Restorative Exercise for Clinical Low Back Pain (A Prospective Two-Center Study With 1-Year Follow Up)

Spine

November 1999 Volume 24, Number 9

Scott Leggett, MS, Vert Mooney, MD, Leonard N. Matheson, PhD, Brian Nelson, MD, Ted Dreisinger, PhD, Jill Van Zytveld, BA and L. Vie, BA
Physicians Neck and Back Clinic, Minneapolis, Minnesota
University of California, San Diego

Study Outcomes & Clinical Relevance: *A combined study between Physicians Neck and Back Clinic (PNBC) and the University of California at San Diego, using similar exercise-only protocols were able to achieve comparable excellent results with comparable spine patients.*

Health care reutilization was dramatically reduced at both clinics to almost identical levels, thus validating the results of each. In the year after completion of treatment, only 12% of PNBC patients needed to re-enter the health care system for spinal problems.

Early Aggressive Exercise for Postoperative Rehabilitation After Discectomy

Spine

April 2000 Volume 25, Number 8

Danielsen JM; Johnsen R; Kibsgaard SK; Hellevik E
Institute of Manual Therapy, Mo i Rana; the Institute of Community Medicine, University of Tromso, and Rana Hospital, Mo i Rana, Norway

Study Outcomes & Clinical Relevance: *Vigorous medical exercise therapy, started 4 weeks after surgery for lumbar disc herniation, reduced disability and pain after surgery. Because no differences in clinical end points were observed, there is hardly any danger associated with early and vigorous training after operation for disc herniation.*

As has been demonstrated again and again, active therapy prevails over passive or no therapy. In this study, surgery alone was insufficient to optimize outcomes, even when supplying patients with a few home exercises. Furthermore, several studies indicate spine patients (non-surgical and post-surgical) can tolerate very intensive conditioning programs. Given the present body of evidence, surgeons should be strongly encouraged to refer postoperative spine patients for supervised therapy by skilled professionals to ensure the best possible outcomes.

Low Back Strengthening for the Prevention and Treatment of Low Back Pain

Medicine and Science in Sports and Exercise
1999 Volume 31, Number 1
David M. Carpenter and Brian W. Nelson

Study Outcomes & Clinical Relevance: *Isolated lumbar extension exercise with the pelvis stabilized using specialized equipment elicits the most favorable improvements in low back strength muscle cross-sectional area, and vertebral bone mineral density. Improvements occur independent of diagnosis, are long-lasting, and appear to result in less re-reutilization of the health care system than other more passive treatments.*

Philadelphia Panel Evidence-Based Clinical Practice Guidelines on Selected Rehabilitation Interventions for Low Back Pain

Physical Therapy
October, 2001 Volume 81, Number 10
Collective Name: Philadelphia Panel

Study Outcomes & Clinical Relevance: *According to this expert panel, only therapeutic exercise has enough scientific support to warrant its recommendation as an intervention in the treatment of chronic, subacute, and postsurgical low back pain. These recommendations essentially match other national and international practice guidelines. Advantages of an active approach to physical rehabilitation include empowering the patient, decreasing dependency on the health care provider, and impacting other health-related risk factors of secondary interest. Of interest to practitioners working in MedX-equipped facilities, this review did include a randomized controlled trial by Risch et al. (1993) that utilized MedX as an effective, high-technology intervention in the treatment of chronic low back pain.*

Changes in Isometric Strength and Range of Motion of the Isolated Cervical Spine After Eight Weeks of Clinical Rehabilitation

Spine
1992 Volume 17, Number 68
Thomas R. Highland, MD, Thomas E. Dreisinger, PhD, Laura L. Vie, BEd, Garth S. Russell, MD

Study Outcomes & Clinical Relevance: *This study was one of the first studies to objectively measure changes in strength and range of motion in patients with non-spinal cord injuries of the cervical spine. Significant gains were seen in strength as well as range of motion and perceived pain was significantly reduced. This study showed that testing and training of the isolated cervical spine is a safe and viable method of clinical assessment and treatment of a variety of cervical spine disorders.*

Effect of Focused Strength Training After Low Back Injury

North American Spine Society
1993 Annual Meeting San Diego, California

Federation of Spine Associations' Council of Musculoskeletal Specialists
1994 Annual Meeting New Orleans, Louisiana
V. Mooney, L. Matheson, D. Holmes, S. Leggett, J. Grant, S. Negri, B. Holmes (University of California San Diego—Orthomed)

Study Outcomes & Clinical Relevance: Focused training after low back injury appears to be an efficacious approach to treatment with broad effect. Not only were significant effects found with improvement in back strength, but these effects generalized to improvement in lifting capacity, self-perception, pain rating, and activity level.

A Rational Approach to the Treatment of Low Back Pain (Most Patients can Achieve Functional Restoration)

The Journal of Musculoskeletal Medicine
May 1993 Volume 10 Number 5
Brian W. Nelson, MD

Study Outcomes & Clinical Relevance: At the initial visit of a patient with low back pain, the physician must set a positive tone, emphasizing that the problem is common in the human body and can be remedied. Initial treatment is 1-2 days of rest, a short course of analgesics, and stretches and other exercises. The 5% to 10% who do not improve within 3 months (chronic pain patients) or have a relapse frequently require an active functional rehabilitation program. Exercises are helpful only if they focus on the lumbar extensors. Patients may need encouragement at the beginning of the program to tolerate discomfort. Expensive imaging studies are reserved for patients who become disabled or show no improvement. Only when a lesion is identified in a patient who has seriously tried and failed conservative rehabilitation is surgery recommended.

Surface Electromyography-Verified Muscular Damage Associated with the Open Dorsal Approach to the Lumbar Spine

European Spine Journal
October 2001 Volume 10, Number 5
Kramer M, Katzmaier P, Eisele R, Ebert V, Kinzl L, Hartwig E

Study Outcomes & Clinical Relevance: The dorsal approach for surgeries to repair vertebral fractures causes damage patterns in the muscles that are caused by the surgery. This approach may disrupt normal function of the multifidi, which can contribute to chronic pain and dysfunction. This supports the rationale for concerted spinal strengthening in such post-operative patients.

The Effect of Trunk Muscle Exercises in Patients Over 40 Years of Age with Chronic Low Back Pain

Journal of Orthopedic Science
2000 Volume 5, Number 3
Department of Orthopaedic Surgery, Kochi Medical School,
Kohasu, Oko-cho, Nankoku, Kochi 783, Japan

Study Outcomes & Clinical Relevance: Like many other recent studies, this study confirms the importance of strengthening the lumbar extensors to improve symptoms in patients with chronic low back pain. Rectus abdominis strength is not compromised to the same degree in such patients and thus should be prioritized accordingly. Other contemporary studies fail to support the outdated notion that weak abdominals are of primary concern in the cause or treatment of low back pain.

Serial Changes in Trunk Muscle Performance after Posterior Lumbar Surgery

Spine

May 1999 Volume 15, Number 24

Department of Orthopaedic Surgery, Toyama Medical and
Pharmaceutical University, Japan

Study Outcomes & Clinical Relevance: *Back muscle injury was directly related to the muscle retraction time during surgery. The damage to the multifidus muscle was more severe and the recovery of extensor muscle strength was delayed in the long-retraction-time group. In addition, the incidence of postoperative low back pain was significantly higher in the long-retraction-time group.*

Although lumbar surgery is often thought to fix whatever is broken, it can introduce new dysfunction such as injury to the multifidi musculature. An active course of spinal therapy to specifically retrain the multifidi may decrease postoperative low back pain resulting from weakness associated with muscular insult.

A Randomized Clinical Trial of Exercise and Spinal Manipulation for Patients with Chronic Neck Pain

Spine

April 2001 Volume 26, Number 7

Bronfort G, Evans R, Nelson B, Aker PD, Goldsmith CH,
Vernon H
Northwestern Health Sciences University
Bloomington, Minnesota

Study Outcomes & Clinical Relevance: *For chronic neck pain, the use of strengthening exercise, whether in combination with spinal manipulation or in the form of a high-technology MedX program, appears to be more beneficial to patients with chronic neck pain than the use of spinal manipulation alone. An additional finding was that 85% of the patients with chronic neck pain were able to engage in MedX therapy with no exacerbation of head or neck pain, and the remaining patients experienced only transient, self-limited discomfort.*

OSTEOPOROSIS PREVENTION

Effects of Isolated Lumbar Extension Resistance Training on Bone Mineral Density of the Elderly

American College of Sports Medicine

Annual Meeting 1992

ML Pollock, FACSM, L Gazarella, JE Graves, FACSM,
DM Carpenter, SH Leggett, D. Lowenthal, MN Fulton,
D Foster, J Tucci, RR Mananquil

Study Outcomes & Clinical Relevance: *Six months of specific lumbar extension exercises can increase bone mineral density of the lumbar spine in the elderly.*

Can Strong Back Extensors Prevent Vertebral Fractures in Women with Osteoporosis?

Mayo Clinic Proceedings

October 1996 Volume 71, Number 10

Sinaki M, Wollan PC, Scott RW, Gelczer RK

Department of Physical Medicine and Rehabilitation, Mayo Clinic
Rochester, Minnesota 55905, USA

Study Outcomes & Clinical Relevance: *Statistical analysis demonstrated a significant negative correlation between the strength of the back extensor muscles and thoracic kyphosis. Significant negative correlations were also found between back extensor strength and the number of vertebral compression fractures and between bone mineral density and the number of vertebral fractures. The negative association between back extensor strength and both kyphosis and number of vertebral fractures suggests that increasing back strength may prove to be an effective therapeutic intervention for the osteoporotic spine. In persons with stronger back muscles, the risk of vertebral fractures will likely decrease.*

Resistance Exercise and Bone Turnover in Elderly Men and Women

Medicine and Science in Sports and Exercise
January 2002 Volume 34, Number 1

Vincent KR; Braith RW
Center for Exercise Science, College of Health and Human
Performance, University of Florida, Gainesville, Florida

Study Outcomes & Clinical Relevance: *This research project consisted of full body resistance exercise training done exclusively on the MedX selectorized and medical exercise equipment. The data indicates that high-intensity resistance exercise training is successful for improving Bone Mineral Density of the femoral neck in healthy elderly subjects. Also, the data suggests that resistance exercise increases bone turnover, which over time may lead to further changes in BMD. The exercises most strongly correlated with site-specific and total-body Bone Mineral Density were leg press, overhead press, and lumbar extension.*

Low Back Strengthening for the Prevention and Treatment of Low Back Pain

Medicine and Science in Sports and Exercise
1999 Volume 31, Number 1

David M. Carpenter and Brian W. Nelson

Study Outcomes & Clinical Relevance: *Isolated lumbar extension exercise with the pelvis stabilized using specialized equipment elicits the most favorable improvements in low back strength muscle cross-sectional area, and vertebral bone mineral density. Improvements occur independent of diagnosis, are long-lasting, and appear to result in less re-reutilization of the health care system than other more passive treatments.*

REDUCING BACK PAIN IN OLDER PATIENTS

Comparison of Female Geriatric Lumbar Extension Strength: Asymptomatic Versus Chronic Low Back Pain Patients and Their Response to Active Rehabilitation

Journal of Spinal Disorders
1996 Volume 9, Number 1

Bryon Holmes, Vert Mooney, Scott Negri, Scott Leggett,
Jean Nichols, An Hoeyberghs

Study Outcomes & Clinical Relevance: *This study confirmed that many back pain sufferers have weaker lumbar extension strength and that some symptomatic geriatric women can*

increase strength with progressive resistance exercise, which leads to a decrease in low back pain.

PROVEN COST SAVINGS IN CORPORATIONS

The Effect of Workplace Based Strengthening on Low Back Injury Rates: A Case Study in the Strip Mining Industry

Journal of Occupational Rehabilitation
1995 Volume 5, Number 3

Vert Mooney, Marvin Kron, Patrick Rummerfield, Bryon Holmes

Study Outcomes & Clinical Relevance: *The purpose of this study was to demonstrate the effect of a once a week exercise program focused specially at lumbar extensor strengthening. There was a 54% to 104% increase in strength during the 20 week program. The average workers' compensation liability dropped from \$14,430 per month to \$380 per month for the study year. The significant increase in strength associated with the exercise program correlated with the greatly reduced incidence of back claims.*

ADOLESCENT SCOLIOSIS TREATMENT & PREVENTION

The Role of Measured Resistance Exercises in Adolescent Scoliosis

Orthopedics
February 2003 Volume 26, Number 2

Vert Mooney, MD and Allison Brigham, BS

Study Outcomes & Clinical Relevance: *Twenty adolescent patients (18 girls and 2 boys) with scoliosis ranging from 15-41 degrees in their major curve were treated with a progressive resistive training program for torso rotation. All patients demonstrated an asymmetry of rotation strength measured on specialized equipment, and surface electrode electromyograms showed inhibition of lumbar paraspinal muscles. Sixteen of 20 patients demonstrated curve reduction, and no patient showed an increase in curve.*

A Preliminary Report on the Effect of Measured Strength Training in Adolescent Idiopathic Scoliosis

Journal of Spinal Disorders
2000, Volume 13, Number 2

Vert Mooney, Jennifer Gulick, Robert Pozos
US Spine & Sport Center, Worldwide Clinical Trials, and
San Diego State University

Study Outcomes & Clinical Relevance: *The authors studied 12 adolescent patients with scoliosis (10 girls and 2 boys) who were 11 to 16 years old and had curvatures ranging from 20 to 60 degrees. When tested on the MedX Rotary Torso Machine, both sides were unequal in their torso rotation strength in all patients. These asymmetries were corrected completely with torso rotation, which was associated with significant strength gains. Strength gains ranged from 12% to 40%. A 16 year old girl with a 60 degree lumbar curve progressed and had surgery. None of the remaining patients progressed and 4 of the 12 had decreases in their curvatures from 20 to 28 degrees. These results are equal to or better than 23 hour per day bracing. None of the patients used braces during this study.*

DIFFERENTIATION BETWEEN MEDX LOW BACK MACHINE AND OTHER COMMERCIALY AVAILABLE “LOW BACK EXERCISE MACHINES”

Effect of Resistance Training on Lumbar Extension Strength

American Journal of Sports Medicine

1989 Volume 17, Number 5

Michael L. Pollock, PhD, Scott H. Leggett, MS, James E. Graves, PhD, Arthur Jones, Michael Fulton MD, and Joe Cirulli

Study Outcomes & Clinical Relevance: *This study demonstrates that healthy normal individuals show a significant increase in lumbar extension strength when these muscles are effectively isolated and trained. The magnitude of strength gained over the 10 week period is much greater than strength increases found with the average muscle group within the same period, and indicates that the lumbar extensor muscles were in a deconditioned state prior to training. In addition, 10 of the 15 subjects that trained had reported using the Nautilus low back machine on a regular basis prior to the study period. This supports the concept that commercially-available “low back” machines do not isolate the lumbar muscles and that the lumbar extensor muscles must be effectively isolated through pelvic stabilization in order to elicit a training response from progressive resistance exercise.*

Effects of Pelvic Stabilization on Lumbar Muscle Activity During Dynamic Exercise

Journal of Strength and Conditioning Research

2005 Volume 19 Number 4

Jun G. San Juan, James A. Yaggie, Susan Levy, Vert Mooney, Brian Udermann, and John M. Mayer

Study Outcomes & Clinical Relevance: *Pelvic stabilization is necessary to achieve optimal recruitment of the lumbar extensor muscles during dynamic extension exercises on a lumbar extension machine. Therefore, if the goal is to strengthen the muscles of the low back, it is necessary to stabilize the pelvis with a clinically proven restraint system (found on MedX).*

Pelvic Stabilization During Resistance Training: Its Effect on the Development of Lumbar Extension Strength

Archives of Physical Medicine and Rehabilitation

1994 Volume 75

James, E. Graves, PhD, Michael L. Pollock, PhD, Scott Leggett, MS, Dan Foster, Dina C. Webb, PT, Jan Matkozich, David M. Carpenter, MS, Joseph Cirulli

Study Outcomes & Clinical Relevance: *The “No Stabilization” and the “Stabilization” groups showed significant and similar increases in the weight load for training. However, the post-training isometric torque values describing isolated lumbar extension strength improved only for the “Stabilization” group. Therefore, pelvic stabilization is required to effectively train the lumbar extensor muscles. The increased load for the “No Stabilization” group is attributed to increases in strength of the hamstring and buttock muscles.*

Comparison of Two Restraint Systems for Pelvic Stabilization during Isometric Lumbar Extension Strength Testing

Journal of Orthopedic & Sports Physical Therapy
January 1992 Volume 15, Number 1

James E. Graves, PhD, Cecily K. Fix, MS, Michael L. Pollock, PhD, Scott H. Leggett, MS, Dan N. Foster, MS, David M. Carpenter, MS

Study Outcomes & Clinical Relevance: *The researchers examined the difference in two different stabilization methods (knee and foot restraints). Due to the differences in results, standardization of the restraint system used is important for comparative purposes.*

Electromyographic Analysis of Four Techniques for Isometric Trunk Muscle Exercises

Archives of Physical Medicine & Rehabilitation
1995 Volume 76

M. Shirado, T. Ito, K. Kaneda, and T.E. Strax

Study Outcomes & Clinical Relevance: *Pelvic stabilization is necessary to increase activation of the lumbar extensor muscles during isometric exercise on a low back exercise machine.*

Muscle Comparison of MedX Lumbar Extension To a 45-Degree Roman Chair

Abstract Presentation Columbia, Missouri
October 24, 1996

Laura L. Vie, MAEd, Thomas Highland, MD, Thomas E. Dreisinger, PhD

Study Outcomes & Clinical Relevance: *The Roman Chair uses the same muscles as the MedX, but to a lesser degree. Therefore, both machines are appropriate for specific training of the lumbar extensors. However, when available, MedX is still the preferred exercise because of the greater lumbar activation.*

STRENGTH TRAINING METHODS

Strength Training Methods and the Work of Arthur Jones

Journal of Exercise Physiology Online
December 2004 Volume 7 Number 6

Dave Smith and Stewart Bruce-Low
University College Chester, University of Liverpool

Study Outcomes & Clinical Relevance: *This paper reviews research evidence relation to the strength training advice offered by Arthur Jones, founder and retired Chairman of Nautilus Sports/Medical industries and MedX Corporation. Jones advocated that those interested in improving their muscular size, strength, power, and/or endurance should perform one set of each exercise to muscular failure (volitional fatigue), train each muscle group no more than once (or in some cases twice) per week, perform each exercise in a slow, controlled manner and perform a moderate number of repetitions (for most people 8-12). Jones' training advice is strongly supported by the peer-reviewed scientific literature, a statement that has recently been supported by a review of the American College of Sports Medicine resistance training guidelines.*

PHYSCHOLOGICAL BENEFITS OF REDUCING BACK PAIN

Physiological and Psychological Benefits: Lumbar Strengthening in Chronic Back Pain Patients

Spine

February 1993 Volume 18, Number 2

Sherry V. Risch, PhD, Michael L. Pollock, PhD, Howard Langer, RPT, James E. Graves, PhD, Nancy K. Norvell, PhD, Edward D. Risch, MD, Michael Fulton, MD, Scott H. Leggett, MS

Study Outcomes & Clinical Relevance: *Lumbar extension exercise is beneficial for strengthening the lumbar extensors and results in decreased pain and improved perceptions of physical and psychological functioning in chronic back pain patients.*

The Role of Anticipation and Fear of Pain in the Persistence of Avoidance Behavior in Patients with Chronic Low Back Pain

Spine

May 2000 Volume 25, Number 9

Al-Obaidi SM; Nelson RM; Al-Awadhi S; Al-Shuwaie N
Department of Physical Therapy, Kuwait University, Faculty of Allied Health Sciences and Nursing, Sulaibikhat, Kuwait

Study Outcomes & Clinical Relevance: *The results of this study strongly support the hypothesis that spinal physical capacity in chronicity is not explained solely by the sensory perception of pain. The anticipation of pain and the fear-avoidance belief about physical activities were the strongest predictors of the variation in physical performance.*

This study utilizing MedX technology reveals that the fear of pain can be as functionally debilitating as pain itself. MedX is a perfect solution for defusing fear of movement because treatment can occur in a very restricted range-of-motion with minimal resistance.

THE INEFFECTIVENESS OF TRADITIONAL LOW BACK EXERCISES

Electromyographic Activity of Selected Trunk Muscles during Dynamic Spine Stabilization Exercises

Archives of Physical Medicine & Rehabilitation

November 2001 Volume 82, Number 11

Souza GM, Baker LL, Powers CM

Study Outcomes & Clinical Relevance: *Spine Stabilization Exercises (traditional back exercises taught in therapy and home exercise programs) produced low levels of electromyographic activity (41% of maximum voluntary isometric contraction). Healthy persons may not receive a significant strengthening effect from common, low-technology trunk extensions.*

Effect of Roman Chair Exercise Training on the Development of Lumbar Extension Strength

Journal of Strength & Conditioning Research

May 2003 Volume 17, Number 2

Mayer, JM, Udermann, BE, Graves, JE, Ploutz-Snyder LL
Department of Exercise Science, Syracuse University,
Syracuse, New York 13244.

Study Outcomes & Clinical Relevance: *Following training, peak isometric lumbar extension torque did not increase for the group training on the Roman Chair. It was determined that the Roman Chair primarily strengthened the hamstrings and gluteal muscles.*

Effects of Three Different Training Modalities on the Cross Sectional Area of the Lumbar Multifidus Muscle in Patients with Chronic Low Back Pain

British Journal of Sports Medicine
2001 Volume 35

L A Danneels, G G Vanderstraeten, D C Cambier, E E Witvrouw, J Bourgois, W Dankaerts and H J De Cuyper
Department of Rehabilitation Sciences and Physical Therapy,
Faculty of Medicine, Ghent University, Belgium; Centre of
Sports Medicine, Ghent University Hospital, Belgium;
Department of Physical Medicine and Rehabilitation, Hospital
Jan Palfijn-Campus Gallifort, Antwerp, Belgium

Study Outcomes & Clinical Relevance: *Multifidus muscle wasting appears to be reversible if given the proper intervention. But, spinal stabilization training does not restore atrophied multifidi in the absence of progressive resistance exercises for the low back musculature. The most effective resistance exercise routine in this study used a concentric-eccentric protocol with a 5-second isometric pause with the muscles in their most contracted position.*

Differences in Electromyographic Activity in the Multifidus Muscle and the Iliocostalis Lumborum between Healthy Subjects and Patients with Sub-Acute and Chronic Low Back Pain

European Spine Journal
February 2002 Volume 11, Number 1

Danneels LA, Coorevits PL, Cools AM, Vanderstraeten GG, Cambier DC, Witvrouw EE, De CH
University Hospital, Department of Rehabilitation Sciences
and Physiotherapy, Ghent, Belgium

Study Outcomes & Clinical Relevance: *Back pain patients have a reduced capacity to voluntarily recruit the multifidus in order to obtain a neutral lordosis. Pain, pain avoidance and deconditioning may have contributed to these lower levels of EMG activity during intensive back muscle contraction. This study reaffirms the involvement of the multifidi in the possible pathogenesis of low back pain.*

In this study, low load activity (lumbar stabilization exercises) was insufficient to challenge the multifidi during "stabilization" exercises. This is in agreement with another study previously reviewed in this column that concluded stabilization exercises do not recruit the paraspinal musculature at a level high enough to stimulate strength adaptations. One of the most researched means of accomplishing this spinal overload is via the MedX lumbar extension machine.

THE RELATIONSHIP BETWEEN WEAK LOW BACK MUSCLES AND PAIN

Correlation between the MRI Changes in the Lumbar Multifidus Muscles and Leg Pain

Clinical Radiology

February 2000 Volume 55, Number 2

Kader DF, Wardlaw D, Smith FW

Department of Radiology, Woodend Hospital
Aberdeen, United Kingdom

Study Outcomes & Clinical Relevance: *This study found multifidi muscle atrophy in 80% of patients with low back pain. Interestingly, clinical research using MedX to rehabilitate lumbar spine dysfunction boasts nearly an 80% success rate. Perhaps these figures are coincidentally similar. It is, however, tempting to speculate that the widespread multifidi muscle atrophy in this study and the targeted multifidi training afforded by MedX explain in part the widespread success of MedX therapy across diagnoses. That is, it is possible that various spinal pathologies share at least one common symptom generator: multifidi dysfunction. Thus, addressing this dysfunction should improve a majority of low back pain patients owing to their common trait of aberrant multifidi function. From these data, it can be argued that most patients with lumbar pain should receive physical therapy directed at reconditioning the multifidi.*

CT Imaging of Trunk Muscles in Chronic Low Back Pain Patients and Healthy Control Subjects

European Spine Journal

August 2000 Volume 9, Number 4

Danneels LA, Vanderstraeten GG, Cambier DC,

Witvrouw EE, De Cuyper HJ

Department of Rehabilitation Sciences and Physical Therapy,
Faculty of Medicine, Ghent University, Belgium

Study Outcomes & Clinical Relevance: *This research on nonoperative persons adds to the impressive body of evidence regarding a relationship between multifidi dysfunction and low back pain. It is not known if muscle weakness and atrophy are the cause or the result of chronic low back pain. It is possible that this relationship may depend upon the particular case. Weakness represents an abnormality that requires intervention in the form of isolated spinal strengthening to optimize spinal function.*

THE IMPORTANCE OF CORE STRENGTHENING FOR GOLFERS

Spine Stabilizing Muscles in Golfers (article in German)

Sportverletz Sportschaden

June 2000 Volume 14, Number 2

Rucken- und Fortbildungs-Zentrum (RFZ) am Institut für
Prävention und Diagnostik, Regensburg. RFZ

Study Outcomes & Clinical Relevance: *Golfers have highly significant stronger lumbar extensors and show muscular imbalance in lateral flexors and rotators of the spine. Specific training for well-balanced strengthening of spine-stabilizing muscles seems to be advisable, because muscular imbalance can contribute to the development of back pain.*

Golfers with healthy backs should be tested for bilateral torso rotation strength disparities, and such differences should then be minimized through progressive resistance exercise. A golf conditioning program should include a rotary component that can both test for and address truncal strength asymmetry.

TRAINING FREQUENCY & RELIABILITY STUDIES

Effect of Training Frequency and Specificity on Isometric Lumbar Extension Strength

Spine

1990 Volume 15, Number 6

James E. Graves, PhD, Dan Foster, BS, David M. Carpenter, MS, Arthur Jones, Michael Pollock, PhD, Scott H. Leggett, MS, Rosemaria Vusoso, MA

Study Outcomes & Clinical Relevance: *This study demonstrates that training at low frequencies of 1X/2WK and 1X/WK are as effective in developing lumbar extension strength as training at greater frequencies of 2-3X/WK. These results differ from other more commonly used muscle groups which show greater increases in strength with more frequent training sessions per week. In addition, subjects who trained their lumbar extensors 2-3X/WK complained of chronic fatigue, a sign of over training. The large strength increases with the low volume and frequency of training in this study demonstrate that efficiency of the MedX lumbar extension machine. The dramatic improvements in isolated lumbar extension strength over the 12 week study period indicate that these muscles were initially deconditioned and possess a large potential for strength development.*

Effect of 12 and 20 Weeks of Resistance Training on Lumbar Extension Torque Production

Physical Therapy

1991 Volume 71, Number 8

David M. Carpenter, James E. Graves, Michael L. Pollock, Scott H. Leggett, Dan Foster, Bryon Holmes, Michael N. Fulton

Study Outcomes & Clinical Relevance: *The magnitude of strength gained, particularly in the extended ROM, demonstrates that the lumbar extensor muscles are relatively weak and show a large potential for strength improvement. The flattening of the strength curve over the 20 week study period shows range-specific changes in strength, demonstrating the need for full ROM strength assessment. Had peak torque only been used to describe strength improvement (as in many studies) it would have been concluded that the lumbar extensor muscles are able to gain 17% in strength over a 20 week period, and the more than 120% increases in the extended ROM would have gone unreported. This would have greatly misrepresented the potential for lumbar extensor strength improvement.*

Frequency and Volume of Resistance Training: Effect on Cervical Extension Strength

Archives of Physical Medicine and Rehabilitation

October 1993 Volume 7

Michael L. Pollock, PhD, James E. Graves, PhD, Marcos M. Bamman, MS, Scott H. Leggett, MS, David M. Carpenter, MS, Cecily Carr, MS, Joe Cirulli, Jan Matkozych, Michael Fulton, MD

Study Outcomes & Clinical Relevance: *A single set of cervical extension exercise is required to attain a full range-of-motion increase in strength as long as the training frequency is at least two times per week.*

Effect of Reduced Frequency of Training and Detraining on Lumbar Extension Strength

Spine

December 1999 Volume 17, Number 12

Jacqueline T. Tucci, MS, David M. Carpenter, MS, Michael L. Pollock, PhD, James E. Graves, PhD, Scott H. Leggett, MS

Study Outcomes & Clinical Relevance: *This study demonstrates isometric lumbar extension strength can be maintained for up to 12 weeks with a reduced frequency of training as low as once every 4 weeks when the intensity and the volume of exercise are maintained. Therefore, a patient could return to the clinic for exercise training one time per month to maintain the strength gains made during their clinical program.*

Effect of Resistance Training Volume on Strength and Muscle Thickness

Medicine and Science in Sports and Exercise

1996 Volume 28, Number 10

David Starkey, Michael Pollock, Yoshi Ishida, Michael A. Welsch, William Brechue, James E. Graves, Matthew S. Feigenbaum

Study Outcomes & Clinical Relevance: *One set of high intensity resistance training was as effective as three sets for increasing knee extension and knee flexion isometric torque and muscle thickness in previously untrained adults.*

Isometric Torso Rotation Strength: Effect of Training Frequency on Its Development

Archives of Physical Medicine and Rehabilitation

January 1997 Volume 78

Pamela L. DeMichele, MS, Michael L. Pollock, PhD, James E. Graves, PhD, Daniel N. Foster, MS, David Carpenter, MS, Linda Garzarella, MS, William Brechue, PhD, Michael Fulton, MD

Study Outcomes & Clinical Relevance: *Post-training dynamic strength was not different between training frequencies of 2 and 3 times per week. Therefore, training the rotary torso muscles 2 times per week is recommended.*

Quantitative Assessment and Training of Isometric Cervical Extension Strength

The American Journal of Sports Medicine

1991 Volume 19, Number 6

Scott H. Leggett, MS, Michael L. Pollock, PhD, David M. Carpenter, MS, Michael N. Fulton, MD, James E. Graves, PhD, Michael Shank, MS, Bryon Holmes, MS

Study Outcomes & Clinical Relevance: *Repeated measures of isometric cervical extension strength are highly reliable and can be used for the quantification of isometric cervical extension strength through a 126 degree range of motion. Also, training the cervical extensors 1 day per*

week can significantly increase isometric cervical extension strength through most of the range of motion.

Strength Testing Can Identify Malingering

The Journal of Workers Compensation

1992 Volume 2, Number 1

Vert Mooney, MD, Scott H. Leggett, MS, Bryon L. Holmes, MS,
Scott Negri, MD

Study Outcomes & Clinical Relevance: *Consistent submaximal efforts with visual feedback can be achieved by a subject anxious to deceive the tester. However, with reliable equipment and the potential to manipulate the test circumstances, the apparent consistent performance can document a patient's willful deception.*

Limited Range-of-Motion Lumbar Extension Strength Training

Medicine and Science in Sports and Exercise

1992 Volume 24, Number 1

James E. Graves, PhD, Scott H. Leggett, MS, Cecily K. Fix,
Michael L. Pollock, PhD, David M. Carpenter, MS, Michael N.
Fulton, MD

Study Outcomes & Clinical Relevance: *Limited range of motion (ROM) lumbar extension training through a 36 degree ROM is effective for developing strength through 72 degrees of lumbar extension.*

Quantitative Assessment of Full Range-of-Motion Isometric Lumbar Extension Strength

Spine

April 1990 Volume 15, Number 4

James E. Graves, PhD, David M. Carpenter, MS, Arthur
Jones, Michael N. Fulton, MD, Michael Pollock, PhD,
Scott H. Leggett, MS, Michael MacMillan, MD

Study Outcomes & Clinical Relevance: *Repeated measures of isometric lumbar strength are highly reliable and can be used for the quantification of isometric lumbar strength through a range of motion.*

Quantitative Assessment of Lumbar Paraspinal Muscle Endurance

Journal of Athletic Training

September, 2003 Volume 38, Number 3

Udermann, BE, Mayer JM, Graves JE, Murray SW
University of Wisconsin-La Crosse

Study Outcomes & Clinical Relevance: *Both the MedX Lumbar Extension Machine and the Roman Chair are useful tools when assessing lumbar muscular endurance.*

MISCELLANEOUS

Do Knee Injuries have Long-Term Consequences for Isometric and Dynamic Muscle Strength?

European Journal of Applied Physiology

August 2001 Volume 85, Number 3

Holder-Powell HM; Di Matteo G; Rutherford OM

Applied Biomedical Research Group, GKT School of Biomedical Sciences, Kings College, London, Guy's Campus, London SE1 1UL, UK

Study Outcomes & Clinical Relevance: *Despite the popularity of “functional rehabilitation” that emphasizes compound movements, this study, like several others, documents weak links in the kinetic chain long after function has supposedly been regained. Complex movements may involve a number of motor compensations that create an illusion of normalcy, but the best way to detect persistent underlying anomalies is through isolated joint testing.*

The knee medical machine manufactured by MedX is capable of identifying such disparities through multiangular isometric testing and treating deficiencies with dynamic variable resistance.

Differences in Back Extensor Strength Between Smokers and Nonsmokers with and without Low Back Pain

Journal of Orthopedic Sports Physical Therapy

May 2004, Volume 34, Number 5

Al-Obaidi SM, Anthony J, Al-Shuwai N, Dean E

Department of Physical Therapy, Faculty of Allied Health Sciences and Nursing, Kuwait University, Kuwait

Study Outcomes & Clinical Relevance: *Individuals who smoked were weaker than those who did not smoke, but no difference in strength was noted between smokers with and without LBP. Although smoking appears to be an important cofactor in the etiology of LBP, the degree to which smoking is a primary, secondary, or a component of a combined etiology warrants further study.*

Strength Testing of the Isolated Cervical Spine: A Five-Year Follow-Up

Abstract Presentation Columbia, Missouri

October 24, 1996

Thomas E. Dreisinger, PhD, Laura L. Vie, MAEd, Thomas Highland, MD

Study Outcomes & Clinical Relevance: *The five year follow-up showed that patients had lost cervical extension strength from the initial training. Even after five years, however, peak torque had remained significantly greater than the initial strength test.*

