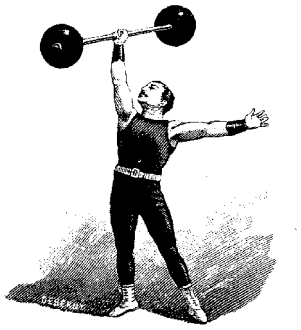
# Specific Spinal Exercise

## Three Case Studies Using the MedX Lumbar Extension Machine



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IART Research

## Abstract

The purpose of this research project was to ascertain the effects of specific exercise for the lumbar muscles, by way of the MedX Lumbar Extension Machine, and relative to previous years of exercise without such a machine. Three subjects improved lumbar strength significantly, and in one instance, became pain-free within two months although two years of previous chiropractic and physiotherapy proved ineffective. In two other instances, it became obvious that traditional exercise, including heavy deadlifts, squats and bent barbell rowing had no positive effect on maintaining or improving lumbar strength.

## Introduction

Research has indicated emphatically that specific exercise for the lumbar muscles, in an environment that encourages thigh and pelvic restraint, is both superior and necessary to strengthen those muscles.[1,2,3,4,5,6,7,8,9,10] Improvement of tissue integrity was determined at the University of Florida by way of isolated strength testing dynamometry and dual-energy x-ray absorptiometry (DEXA; a device that measures bone-mineral density and muscle mass).

What most of the above noted research indicated was that improvement can be made, and is made best by way of full range isolation, as per the use of the MedX Lumbar Extension Machine. Although some research has looked into the issue of detraining of the lumbar muscles[11], this aspect has not been explored to any significant degree.

The purpose of this research paper was to investigate three case subjects and the implications of using the MedX Lumbar Extension Machine, those subjects being:

1. A person who experienced muscle strengthening on the MedX Lumbar Extension Machine, but who discontinued use of the machine for a period of ten years.
2. A person who is a long-time and serious/competitive fitness enthusiast who had not used the MedX Lumbar Extension Machine.
3. A person who incurred a low-back injury from an automobile accident, and who had experienced pain and weakness as a result.

It is important to look at the differences among potential clients for specific and isolated exercise of the lumbar muscles, to determine its value both short- and long-term. Doing so may disclose the value of such training, and relative to the contrary position of non-specific exercise, i.e., today's so-called 'functional' training that incorporates full body movement to enhance function.

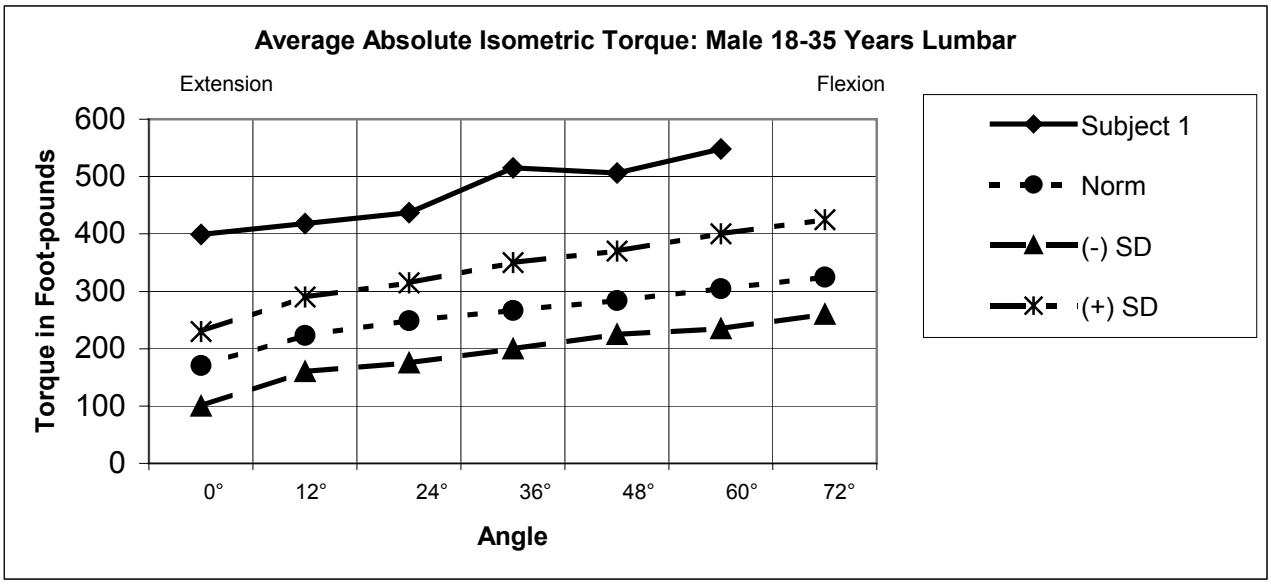
## METHODS

### Subjects

Only July 14, 1995, at age 30, Subject 1 (the author) was tested on the medical version of the MedX Lumbar Extension Machine. A fairly normal strength curve was produced (with only slight deviation from normal at about the midpoint of the range of motion), and he was able to exert a force of about 475 lbs/215.46 kg at approximately 30-degrees, or the upright seated position (437 lbs/198.22 kg at 24-degrees and 515 lbs/233.6 kg at 36-degrees). Also, this person was considered more than two standard deviations above normal for lumbar muscle strength for his age and sex, as shown in figure 1, with about 255 lbs/115.7 kg being the norm torque output at the 30-degree position. Standard deviations from normal also are shown on the chart. The different test positions are shown in Figure 2.

Furthermore, Subject 1 is no stranger to heavy, intense exercise, as evidenced in Photos 1-3 (taken at age 40 in July 2005). He has performed heavy bent rows, squats, and deadlifts for several years.

**Figure 1: Subject 1 MedX Lumbar Test, July 14, 1995**




**Photos 1-3 of Subject 1 at age 40 show the musculature achieved from brief, intense and heavy exercise, but which exercise did little to maintain or increase the strength of his lumbar muscles.**

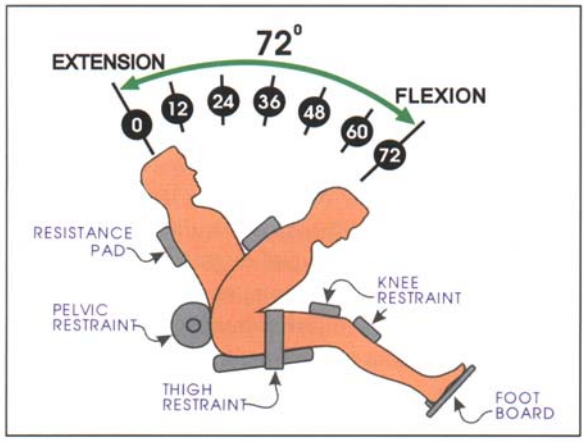



**Figure 2:** The test positions of the medical version of the MedX Lumbar Extension Machine, from 0-degrees (extension) to 72-degrees (flexion).

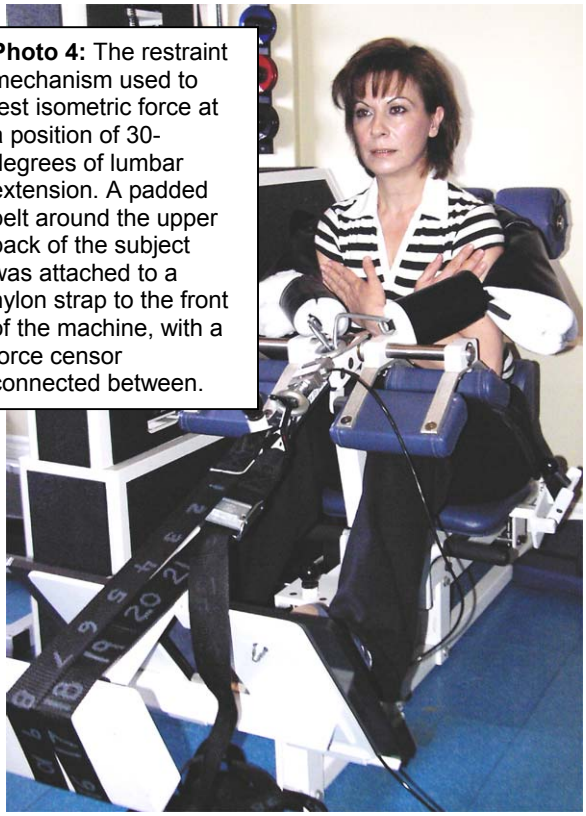


**Photo 4:** The restraint mechanism used to test isometric force at a position of 30-degrees of lumbar extension. A padded belt around the upper back of the subject was attached to a nylon strap to the front of the machine, with a force censor connected between.

Subject 2 (age 52) is a long-time fitness enthusiast, who competed in bodybuilding, and more recently in firefighter combat challenges (he set a Canadian record for age 50-60, by completing the competition in 2 minutes and 5 seconds). With over 30 years of intense strength training and bodybuilding, as well as continual training for firefighter conditioning and competition, it would be expected that his lumbar muscles are very strong or, at least, above normal.

Subject 3 suffered low back and neck injuries as a result of an automobile accident more than two years previous. Earlier work with physiotherapists and chiropractors provided little pain relief or change in her condition and function.

## PROCEDURES

Subjects were restrained in the MedX Lumbar Extension Machine, at an upright 30-degree position, and tested isometrically with the Dillon Quantrol Strain Gauge and a 225 kg capacity load cell located within the upper body restraining device (rigged between the machine's frame and the subject, as shown in Photo 4). To test muscle torque, subjects for this research project attempted to extend the spine, but could not move because of this restraint device, and the legs and hips could not contribute to force output because of the restraining mechanisms of the machine. Each isometric test resulted in 2-seconds to ease into tension, 5-seconds to produce a maximum effort, and then 2-seconds to ease out of tension. Future tests to determine muscle torque change from specific exercise on the MedX machine included the same restraint setup and positioning.

A fixed/isometric upright position of 30-degrees for testing purposes was so chosen for several reasons. One, to eliminate impact forces (that occur as a result of dynamic movement). Two, to eliminate the effects of gravity (i.e., the mass of the torso's influence on helping or hindering force output), when the torso is leaned either forward or backward. Three, to eliminate the effects of stored energy (stretching and compression of tissues around the lumbar spine when bent forward or backward). And four, to replicate an exact position for every test.

Most exercise sessions consisted of 5-7 repetitions per subject (a few were as high as 9 repetitions, when the estimated weight was insufficient), at a cadence of 5-5, for one set of exercise. Exercise varied in frequency, because of experience, the load used, and intensity of effort. Subject 1 exercised his lumbar muscles every 12 days on average; Subject 2 exercised his lumbar muscles every 10 days on average; and Subject 3 exercised her lumbar muscles every 7 days on average. Only the lumbar muscles were exercised on this machine since the thighs and hips were restrained appropriately, as per the machine's design.

On January 9, 2005 (almost ten years after an initial MedX strength test described previously, and now at age 40), Subject 1 similarly was restrained in the non-medical version of the MedX Lumbar Extension Machine, and produced only 274.6 lbs/124.56 kg at a position of 30-degrees; a loss of approximately 42% from when he initially was tested in 1995 (Note: 245 lbs/111 kg is considered normal[12] for this subject's current age and sex, thus suggesting that even with a loss of strength Subject 1 still was above normal in torque output).

This subject indicated that loss of lumbar strength became apparent over the years, although he had no way to quantify the effects at the time of this experiment. A loss of function occurred regardless of heavy squats, deadlifts, bent rowing, and other exercises that would have placed a strain on his lumbar muscles and spine. However, such a strain from those exercises always was limited to a fixed position in a possible 72-degrees of motion, whereby the subject's hips, gluteals and thighs contributed most of the force output to create movement or to maintain stasis during those exercises.

Although a person can and will lose function as he or she ages, various exercise loads (e.g., dips, chest presses, leg presses, etc.) for this subject remained relatively the same over the past 10 years, as did body composition and girth measurements. However, research suggests that the lumbar muscles are not like other muscles, and begin to deteriorate within a person's second decade of life[13,14], whereas that is not the case with other muscles until the third or fourth decade of life (and only if not exercised to prevent strength and lean mass loss).

The question, then, was whether this subject could rehabilitate his lumbar muscles to their previous function and ability. (Note: The term "rehabilitate" is valid, although the muscles may not be 'injured,' since they reduced a great deal in function with this subject. Furthermore, a person with less strength initially, and with a slow twitch response [a low fatigue rate] would not experience such a degree of atrophy in the lumbar muscles, since that fiber type is less susceptible to atrophy from disuse, but also less inclined to hypertrophy from proper exercise.)

Subject 1 was provided 15 training sessions, which began with 200 pounds for 7 repetitions, and ended with 320 pounds for 5 repetitions, from January 9, 2005 to July 19, 2005. The number of repetitions reduced from 6-7 to 5 (a 50-second tension time) once reaching 300 pounds of exercise load, to accommodate his quick-to-fatigue lumbar muscles.

On March 29, 2005, Subject 2 produced an initial force output of 93.9 lbs/42.6 kg, positioned at 30-degrees in the MedX Lumbar Extension Machine. However, since he was uncertain of what to do exactly (how hard to exert or the specific method involved in isometric testing), he was retested a week later on April 6, 2005, at which time he produced a more 'honest' and vigorous attempt at 209.8 lbs/95.2 kg (Note: 250 lbs/113.4 kg is considered normal for his age and sex). Subject 2 was provided 12 training sessions, which began with 120 pounds for 6 repetitions and ended with 260 pounds for 6 repetitions, from March 29, 2005 to July 26, 2005.

Subject 3 was provided one training session at a modest load of 60 pounds before being tested. On December 31st this subject produced a force of 118.1 lbs/53.6 kg at a position of 30-degrees (Note: 140 lbs/63.5 kg is considered normal for her age and sex). Subject 3 was provided 12 training sessions, which began with 60 pounds for nine repetitions and ended with 120 pounds, for six repetitions, from December 24, 2004 to May 3, 2005. Because of time constraints and personal issues, this subject terminated her treatments and was not re-tested. Nonetheless, a change could be extrapolated from the collected exercise session data, and which is addressed in the Discussion of this report paper.

## RESULTS

| Experimental Data | Subject 1 | Subject 2 | Subject 3 |
|---|---|---|---|
| **Pre-test** | 274.6 lbs/124.56 kg | 209.8 lbs/95.2 kg | 118.1 lbs/53.57 kg |
| Beginning Exercise Load | 200 lbs/90.72 kg | 120 lbs/54.43 kg | 60 lbs/27.22 kg |
| Ending Exercise Load | 320 lbs/145.2 kg | 260 lbs/117.94 kg | 120 lbs/54.43 kg |
| Number of Exercise Sessions (1 set each) | 15 | 12 | 12 |
| **Post-test** | 341.1 | 334.6 lbs/151.5 kg | NA |
| Test Improvement | 19.5 % | 37.3 % | NA |

## DISCUSSION

Subject 1 showed an improvement of 19.5 %, is 25.25 % stronger than average for his age group and sex, and achieved the change in a total of 14.75 minutes of exercise time over 15 sessions. His strength has increased, although at age 40 it is difficult at this time to determine if he ever will achieve that which he was capable ten years previous.

Subject 2 showed a marked improvement, and this indicated that years of vigorous, traditional exercise did little to improve the strength of his lumbar muscles. Nor did the highly 'functional exercise' that he did through his firefighter combat challenge training help him, as current-day fitness trends would suggest. He increased his torque output by 37.3% with direct, isolated exercise, and now is considered 25.3% stronger than average for his age group, whereas he was 16% weaker than average before his 12 training sessions (that lasted a total of 13-minutes of exercise time). Subjectively, he has reported far greater function and ability in his firefighter challenge training, and particularly with the dummy drag event, which event was more stressful on his low back previous to his MedX treatments.

Subject 3 was tested prior to her tenth treatment, and was able to produce 129.3 lbs/58.65 kg of torque. By her twelfth session she exercised with 120 pounds for 8 repetitions (80-seconds tension time), but unfortunately was not re-tested thereafter. If we consider that static force is greater than positive dynamic ability (by about 20%), and she was able to exercise with 120 pounds for multiple repetitions and a relatively long tension time, her isometric torque output likely would have been at about 140-150 pounds (63.5-68 kg). This would place her functional ability (at that position) toward 'normal' or better for her age and sex. Subject 3 also indicated that her low back pain was nearly non-existent; noticeable only on occasion. Her total work time over the 12 sessions, for one set each of the exercise was 14 minutes.

## CONCLUSIONS

It is evident that to maintain or improve lumbar strength, traditional exercise (whereby the hips and thighs are permitted to move when exercising the lumbar muscles) provides little effect or benefit. Previous studies have demonstrated as much, but this research included two advanced trainees, whom have been exercising intensely for over 50 years combined, and neither of who experienced or demonstrated any positive benefit from traditional exercise. A third subject, who underwent traditional 'rehabilitative' exercise and treatment under the guidance of physiotherapists and chiropractors, failed to achieve improvement in pain management until she utilized the MedX Lumbar Extension Machine for this project, a common end result from the author's perspective and previous medical rehabilitation experience. Consequently, it seems apparent that strengthening or rehabilitation of the lumbar muscles (if strengthening is emphasized or required) necessitates exercise that restricts hip and thigh movement, and which is achieved only by way of the patented MedX Lumbar Extension Machine.

It may be questioned (and argued) as to why we require such highly isolated exercise since we do not move in like manner in day-to-day activities. But the fact is that other animals walk on all fours (including primates for the most part) without spinal problems, and a deterioration of the lumbar muscles in such a situation does not become a concern as a result. Conversely, walking in a bipedal fashion places the spine in a highly susceptible position for injury, and the deterioration of the lumbar muscles (as the hips and thighs serve to contribute most to human mobility when coordinated with spinal movement) therefore necessitates specialized and unique exercise for the lumbar muscles.

## ACKNOWLEDGEMENTS

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