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PREVIEW

The University of Southern Mississippi

**PELVIC STABILIZATION EXERCISE VERSUS CONVENTIONAL  
WEIGHT TRAINING EXERCISE DURING RESISTANCE TRAINING: ITS  
EFFECT ON THE DEVELOPMENT OF LUMBAR EXTENSION STRENGTH**

by

Mark Allen Belcher

A Dissertation  
Submitted to the Graduate School  
of The University of Southern Mississippi  
in Partial Fulfillment of the Requirements  
for the Degree of Doctor of Philosophy

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December 1998

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PREVIEW

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## ABSTRACT

### PELVIC STABILIZATION EXERCISE VERSUS CONVENTIONAL WEIGHT TRAINING EXERCISE DURING RESISTANCE TRAINING: ITS EFFECT ON THE DEVELOPMENT OF LUMBAR EXTENSION STRENGTH

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The purpose of this study was to compare the difference of strengthening the lumbar spine using the MedX Lumbar Extension Machine and performing a *dead lift* exercise using free-weights. Subjects were randomly assigned to 8 weeks of dynamic strength training utilizing the MedX ( $n=23$ ), performing the *dead lift* exercise ( $n=22$ ), or a non-exercising Control group ( $n=10$ ). Results indicated that there was no significant difference in strength gains between the treatment groups and no significant strength change in the Control group. There was, however, a significant interaction among the treatment groups for test-day by angle by group. This interaction possibly revealed a beginning strength improvement within the MedX group and a plateauing of strength within the Free-Weight group.

The improvements seem to yield credence to two thoughts: 1) that it takes at least 8 weeks for significant

increases in muscle strength to begin, and 2) that isolation of a muscle group appears to yield greater strength than neurologic overflow from synergistic muscles.

PREVIEW



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## CHAPTER 1

### INTRODUCTION

The development of lumbar extension strength is known to be vital in the life of those involved in athletics, in recovery from back surgery, in prevention of low back pain, and in improvement of posture. As early as 1856, Dr. Gustav Zander designed devices for *mechanical-medical* therapy to provide progressive resistance exercise (Mooney, 1992). However, for a period of time between the turn of the 19<sup>th</sup> century and 1942, exercise as a means for better health through increased strength was overlooked. In 1942 Dr. Tom DeLorme instituted the concept of progressive resistive exercise which eventually became a standard in rehabilitation subsequent to World War II (Mooney, 1992). His work helped begin a tremendous revolution in the concept of employing strengthening exercises to promote general health.

Although many techniques have been devised to increase strength, it remains that only by hypertrophy of muscles can an increase to the structural integrity of bone and connective tissue be attained (Tucci, Carpenter, Pollock, Graves, & Leggett, 1992). For this reason, resistance training or muscle over-loading is commonly used to promote physical fitness and the prevention and rehabilitation of musculoskeletal disability (McArdle, Katch, & Katch, 1991; Pollock & Schmidt, 1995; Soderberg, 1997).

Quantification of lumbar extension strength has often been complicated due to the combined involvement of the gluteals, hamstrings, and erector spinae muscles. Mayer and Greenberg (1942) noted that lumbar-pelvic rotation, due to the hamstrings and gluteals during lumbar testing, contributes to the lumbar extension strength. Smidt et al. (Smidt, Herring, & Amundsen, 1983) demonstrated the importance of stabilizing the pelvis and lower extremities to isolate the erector spinae during testing. Thus, some researchers believe that effective assessment and training of the lumbar extensor musculature requires stabilization of the pelvis to isolate the erector spinae and minimize the contribution of the hamstrings and gluteals (Graves, Pollock, & Carpenter 1990a; Graves, Pollock, & Foster, 1990b; Pollock, Graves, Leggett, Jones, Fulton, & Cirulli, 1989).

Investigators have documented different methods of lumbar extension strengthening. For example, Graves, Webb, Pollock, Matozich, Leggett, and Carpenter (1994) tested the difference in the MedX Lumbar Extension Machine, the Nautilus lower back machine, and the Cybex Eagle back extension machine in producing lumbar strength. It was concluded that although all methods revealed an increase in back extension strength, only the MedX displayed an increase in the torque production capacity of the isolated erector spinae. This has ultimately been shown to be due to the

strengthening, which isolates the erector spinae (Graves et al., 1990a; Graves et al., 1990b; Pollock, Graves, & Leggett, 1991).

In contrast to machines that either train all muscles involved in lumbar extension, like the Cybex or Nautilus, or like the MedX, which train the erector spinae specifically by pelvic stabilization, a more common type of back strengthening exercise is the use of free weights. Free weight exercises are designed to strengthen specific muscles by causing them to overcome a fixed resistance. Using free weights the effects of gravity, maintaining balance, and mechanical advantage are compensated by synergistic muscles. This synergistic muscle activity will positively increase the strength of the erector spinae by cumulative activity (Brunnstrom, 1975; Soderberg, 1997). Thus, it would be of interest to see if an increase in lumbar strength utilizing pelvic stabilization is greater than lumbar strength gained using free weights.

#### Purpose of the Study

The purpose of this study was to determine whether resistance training utilizing pelvic stabilization rather than a conventional weight training program is more beneficial in the development of lumbar extension strength.



### Research Question

What is the effect of resistance training utilizing pelvic stabilization versus a conventional weight training program on lumbar extension strength?

### The Research Hypotheses

The following null hypotheses were tested in this study:

- HO<sub>1</sub>: Eight weeks of pelvic stabilization resistive training and conventional free weight resistive training will display no interaction of strength throughout lumbar range-of-motion.
- HO<sub>2</sub>: Eight weeks of pelvic stabilization resistive training (MedX) will have no effect on lumbar strength throughout lumbar range-of-motion.
- HO<sub>3</sub>: Eight weeks of conventional free weight resistive training (straight-leg dead-lift) will have no effect on lumbar strength throughout lumbar range-of-motion.
- HO<sub>4</sub>: Eight weeks of lumbar strengthening will display no difference in strength between pelvic stabilization resistive exercise (MedX) and conventional free weight exercise (straight-leg dead-lift) throughout lumbar range-of-motion.

### Delimitations

This study was limited to healthy individuals between the ages of 18 and 55. The three groups consisted of those individuals exercising using pelvic stabilization, those

using free weights, and a Control group that performed no exercise. The subject sample was limited to a 25 mile radius from The University of Southern Mississippi (USM), and was recruited via campus advertisement. This study was conducted from May 15, 1997 to August 15, 1997. No person with a known chronic low-back pain was admitted as a subject of the study. No person was admitted as a subject of the study that had a known orthopedic or cardiovascular pathology that might confound this investigation. Prescribed medication specifically for anti-inflammation, pain, cardiac or pulmonary abnormalities, or hypertension was prohibited. No subject began any other activity or altered their normal daily routine during the study, however, walking was permitted. No subject already participating in a specific lumbar strengthening program was permitted to serve as a subject of this study.

#### Limitations

The work loads of the pelvic stabilization resistance training group and the free weight resistance training group were not equated.

#### Assumptions

1. All the subjects met the criteria of this study and did not present any unusual physical or emotional states that may influence the results.

2. Each subject followed research and testing