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**A COMPARISON OF ABDOMINAL AND
HIP FLEXOR MUSCLE ACTIVATION
BETWEEN TWO SELECTORIZED
STRENGTH TRAINING MACHINES**

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INTRODUCTION

Many exercise protocols and programs have been developed to strengthen the core musculature. Given the variety of machines and exercises that train these muscles, it is advantageous to measure the effectiveness of these different options.

High hip flexor muscle activity during abdominal training has been demonstrated to exert high shear and compressive loading on the lumbar spine. This may be of concern to those at risk for developing, or already suffering from, low back pain. Therefore, it would be desirable to develop a strength training machine that effectively targets the core musculature while simultaneously minimizing hip flexor activity.

OBJECTIVES

Measure core and hip flexor activity on two different abdominal strength training machines.

METHODS

Twelve healthy subjects volunteered to participate in this study. All subjects performed 10 repetition maximum tests on two different abdominal machines. The two abdominal machines under investigation were:

1. A prototype Cybex Eagle NX Abdominal (CY), featuring stationary anchor points for the legs and imposing a flexed knee and a neutral hip position (Figure 1, left)
2. A crunch-style device (CR), starting with a flexed knee and hip position, and featuring mobile anchor points for the legs (Figure 1, right)



Figure 1. The two abdominal resistance machines (CY on left, CR on right), with arrows indicating the resistance arm's approximate point of contact with the user

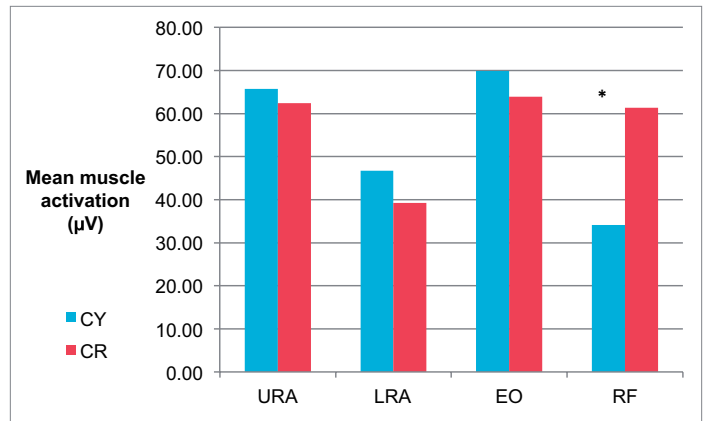


Figure 2. Mean activation for the four muscles under investigation for both the Cybex (CY) and crunch-style (CR) abdominal strength training machines. * Indicates statistically significant difference ($P < 0.05$).

Subjects attended two different testing sessions. The first determined the maximum weight that each subject could work against for ten repetitions on each machine. During the second testing session, electrodes were placed on the subject's skin in order to measure the electrical activation of the hip flexor and core musculature. All repetitions on both machines were performed at a consistent speed and range of motion.

RESULTS

The two machines resulted in similar core muscle activity, while the CY machine resulted in 79.6% lower hip flexor activity compared to the CR machine (Figure 2).

CONCLUSIONS

Increased hip flexor activity during abdominal exercise may be a concern to those at risk for low back pain. The Cybex Eagle NX Abdominal resulted in significantly lower hip flexor activity with no decrease in core activation. Users may wish to avoid excessive stress imposed on the low back that could arise when using a crunch-style abdominal machine.

This study is available in its entirety at: <http://www.cybexintl.com/education/research.aspx>