

## TRUNK MUSCLE ACTIVATION PATTERNS COMPARING CABLE PRESS AND BODY-BLADE® EXERCISES

Janice M. Flynn, Francisco J. Vera-Garcia, Stephen H.M. Brown, Stuart M. McGill  
Spine Biomechanics Laboratory, Department of Kinesiology, University of Waterloo, Canada  
Email: jflynn@uwaterloo.ca

### INTRODUCTION

Rehabilitation professionals often rely on intuition and subjective observation to choose treatment techniques. Our objective is to provide some quantitative information to assist decision-making. The Body-blade®, a 122 cm, .68 kg flexible rod with a resonance frequency of 4.5 Hz. is frequently used for recruiting the stabilizing muscles of the trunk and shoulder girdle, yet no in-depth analysis has been undertaken to justify this treatment choice. The purpose of this study was to compare the electromyographic (EMG) amplitudes and recruitment patterns of the trunk muscles during simple cable pulleys and compare them with various exercises using the Body-blade®.

### METHODS

Fourteen recreationally trained men (age =  $28.14 \pm 8.33$  yr, height =  $1.78 \pm 0.05$  m, mass =  $77.78 \pm 10.41$  kg) were recruited from the university population. All subjects were right-handed and healthy, without current back or shoulder pain. Superficial EMG was measured of the right anterior deltoid (AD) and pectoralis major (PM), bilateral rectus abdominis (RA), external oblique (EO), internal oblique (IO), latissimus dorsi (LD), and erector spinae at 3 levels (EST9, ESL3, ESL5), while subjects performed standing cable press and Body-blade® exercises.

The EMG was A/D converted at 12 bit resolution at 1024Hz. Signals were full wave rectified and low pass filtered (single pass Butterworth) at 2.5 Hz, and then normalized to maximal voluntary contraction (MVC) amplitudes. The normalized muscle activity corresponding to a 2-second window of co-ordinated Body-blade® or cable press use was then averaged over the 14 subjects for each exercise.

### RESULTS AND DISCUSSION

Cable presses resulted in high levels of EMG activation in the shoulder muscles, followed by the left IO and LD. Large amplitude Body-blade® oscillations, with the blade in a vertical orientation and oscillations in a medial/lateral direction, produced large increases bilaterally in the IO amplitude, as well as moderate bilateral EO activity. When oriented horizontally (vertical oscillations), the highest muscle activity was seen in the back muscles: LD and UES, as well as RAD (Figure 1).

Vertical orientation of the Body-blade® resulted in the greatest activation levels of the IO (avg 48% MVC bilaterally) and EO (avg 26% MVC) muscles, thought to be critical contributors to lumbar spine stability [1]. Previous research has demonstrated that IO surface electrodes adequately represent Transverse Abdominis (TA) activation within 15% RMS difference [2], suggesting that TA is equally trained with this exercise.

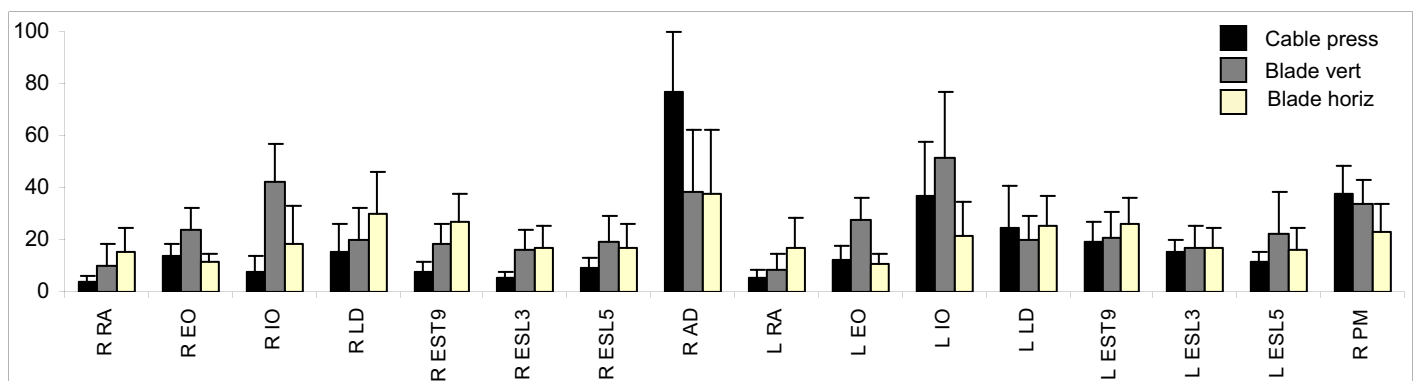
Horizontal orientation of the blade resulted in very little EO or IO activity.

### CONCLUSIONS

The Body-blade® is a superior exercise modality for recruitment of the IO and EO muscles, when used in a vertical orientation. As such, it could be a valuable asset to exercise programs aimed at optimizing muscle recruitment patterns, which are known to stabilize and support the lumbar spine.

### REFERENCES

- McGill SM. *Ultimate back fitness and performance*. Wabuno Publishers, Waterloo, Canada, 2004.
- McGill SM, et al. *J Biomech* **29**, 1503-1507, 1996.



**Figure 1.** Mean EMG amplitudes (mean, SD) for cable presses, vertical and horizontal orientation Body-blade® oscillations.