

## TRUNK AND SHOULDER MUSCLE RESPONSE COMPARING ONE REPETITION MAXIMUM BENCH AND STANDING CABLE PRESS

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### INTRODUCTION

With the current interest in core and functional training, the use of cables and pulleys in standing positions to train the whole body while emphasizing pressing or pulling motions is becoming more popular [1]. Little is known about the effects of these cable exercises on trunk muscle activity. The purpose of this study was to compare the amplitude of the electromyography (EMG) and the coactivation patterns of the trunk muscles during the single arm staggered stance cable press and the traditional bench press.

### 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 recorded bilaterally from rectus abdominis (RA), external oblique (EO), internal oblique (IO), latissimus dorsi (LD) and erector spinae at T9, L3 and L5 (EST9, ESL3, ESL5). EMG was also collected on the right side from pectoralis major (PM) and anterior deltoid (AD).

After warming-up, subjects performed bench and standing press exercises. Resistance was progressively increased until reaching the participant's one repetition maximum (1RM). Rest periods of 2-5 minutes between exercises were utilized in order to avoid muscular fatigue.

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 the pushing phase of the 1RM was averaged for each press exercise. Differences in average normalized activity for each muscle between exercises and between muscles during each exercise was assessed using a two-way ANOVA (muscle/exercise) with Tukey correction ( $\alpha = 0.05$ ).

### RESULTS AND DISCUSSION

1RM bench press performance resulted in an averaged load ( $74.2 \pm 17.6$  kg) significantly higher than 1RM single arm standing press ( $26.0 \pm 4.4$  kg). Pressing from a standing position imposes greater demands on the motor control system to stabilize and balance the body – this reduces the capacity to push heavy weights.

The significant differences among exercises are shown in Figure 1. EMG amplitudes of the erector muscles (EST9, ESL3, ESL5) and pectoralis major (PM) were larger for the 1RM bench press. However, the pressure of the trunk on the back electrodes when supine on a bench could modify the EMG amplitudes. On the other hand, the activation levels of left abdominal muscles (LRA, LEO, LIO) and left latissimus dorsi (LLD) were higher for the right arm cable press.

Statistically significant differences in normalized EMG amplitudes were found among muscle sites within each exercise. For the 1RM bench press, anterior deltoid (AD) and pectoralis major (PM) were more activated than the most of the trunk muscles, although this exercise produced important mean levels of trunk muscle activation (Figure 1). In contrast, for the 1RM standing cable press, the left internal oblique (LIO) and left latissimus dorsi (LLD) activities were similar to the anterior deltoid activity (AD) and higher than the pectoralis major activation (PM).

### CONCLUSIONS

The traditional bench press emphasizes the activation of the shoulder and chest muscles and challenges the ability to develop great shoulder torques. Whereas, a single arm standing press principally activates the contralateral abdominal and latissimus dorsi muscles and challenges the ability to produce smaller forces but in more functional horizontal plane. Coaches and fitness professionals should consider these differences when prescribing exercises to develop pushing or pressing abilities.

### REFERENCES

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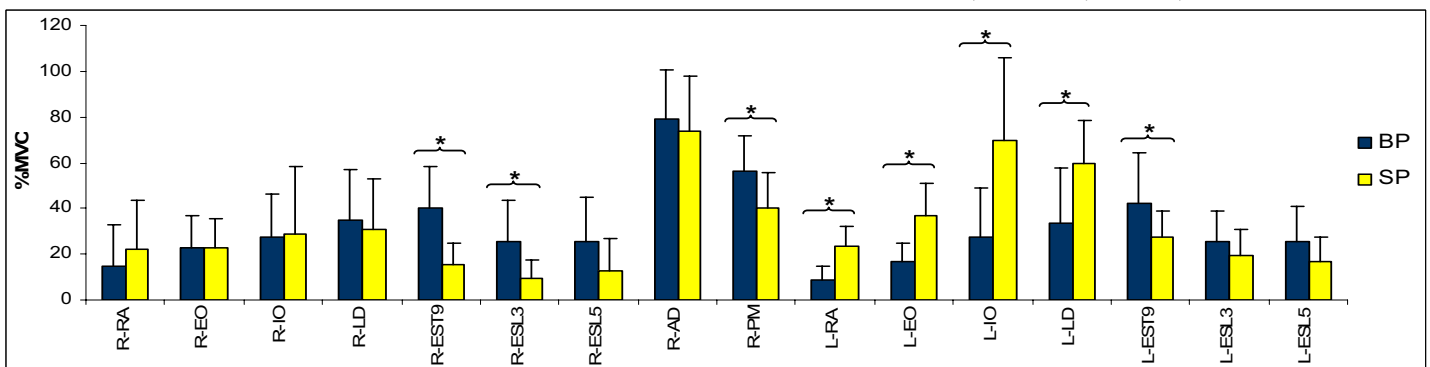


Figure 1. Averages and SD of the mean EMG amplitudes for 1RM Bench (BP) and Standing Press (SP). \*Significance ( $P < 0.05$ ).