A COMPARATIVE EMG STUDY OF TRUNK MUSCULATURE USING EXERCISE EQUIPMENT

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INTRODUCTION

This study compares abdominal and cervical muscle activity while performing a traditional crunch with the same activity performed on a commercial device, The Bean[TM]. Manufacturers purport that a crunch performed on The Bean [TM] should produce between 55-72% more activity in upper and lower rectus muscles and oblique muscles. Biomechanical vector analysis comparing the load on cervical muscle long neck flexors may produce different results for the two activities due to the semi-sitting starting position that is recommended for the training device. Electromyography has been used previously to quantify the comparative work done by muscles in performing a crunch using different techniques or devices [1]

METHODS

Thirty Four participants (males 21, females 13) performed 10 repetitions on both apparatus, in a randomly allocated order. Surface electromyography (EMG) measured the muscular activity of the upper and lower sections of the rectus abdominis (RA), the external oblique (EO) and the sternocleidomastoid (S). A repeated measures analysis of variance (ANOVA) was used to determine any significant difference in peak activity and half peak width for all the above muscles.

RESULTS AND DISCUSSION
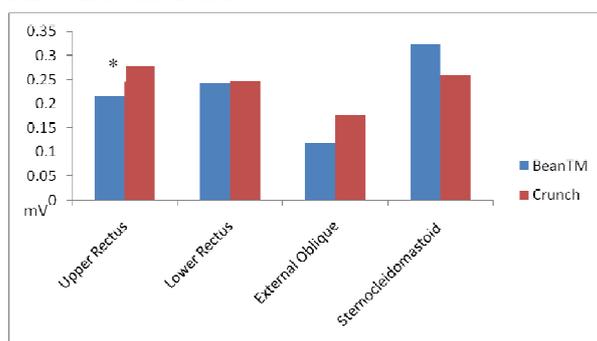
Figure 1: EMG peak for trunk musculature while performing The Bean[TM] and traditional crunch.
*significant difference for upper rectus muscles (p=0.005)

The Bean[TM] did not produce statistically significantly higher activation in any of the muscles measured compared to the traditional crunch (Figure 1). There was significantly higher peak activity in the upper rectus performing a traditional crunch compared to a crunch performed using The Bean[TM] (p = 0.005). This may be due to the eccentric load placed on this part of the abdominal muscles during the second half of the crunch activity.

Figure 2: Starting position for the crunch using The Bean[TM] .

Although vector analysis may suggest that a reduction in the amount of work required by the cervical musculature may be possible with The Bean[TM] due to the different angles in the two starting positions, the EMG results of this study do not support this hypothesis \(Figure 2 and Table 1.).

CONCLUSIONS

Our study demonstrated that this apparatus does not produce a significant increase in activity in any of the abdominal muscles as claimed by the equipment manufacturers, and does not reduce load on the cervical long neck flexors.

REFERENCES

1. Sternlicht, E, et al. (2005). "Electromyographical analysis and comparison of selected abdominal training devices with a traditional crunch." *JSCR* **19**(1): 157-162

Table 1:Cervical muscle activity – mean (95% CI)

	Sternocleidomastoid Peak Height (mV)	Sternocleidomastoid Half Peak Width (s)
Bean[TM]	0.323 (0.17-0.47)	1.06 (0.94-1.17)
Crunch	0.259 (0.00-0.52)	1.064 (0.77-1.35)