DO EXERCISE BALLS PROVIDE A TRAINING ADVANTAGE FOR TRUNK EXTENSOR EXERCISES? A BIOMECHANICAL EVALUATION.

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INTRODUCTION

The use of exercise balls is becoming widespread in the exercise and rehabilitation communities even though the effects of performing trunk extensor exercises on an exercise ball have not been assessed. Only a few abdominal muscle exercises have been quantitatively evaluated in both the traditional (mat) and ball styles [1], but the reported benefits for these exercises on a ball have been equivocally applied to all exercises. To address the effect of an exercise ball on extension exercises, a direct comparison of the same exercises on a mat and on a ball is required. The purpose of this study was to evaluate differences in the biological response of muscle activation, lumbar spine posture, and loading variables for extensor exercises performed on two surfaces.

METHODS

Bilateral muscle activation was recorded from seven sites (rectus abdominis (RA), external and internal obliques (EO/IO), latissimus dorsi, thoracic and lumbar erector spinae (TES/LES), and multifidus (MULT)) on eight subjects. Three-dimensional lumbar spine postures (ISOTRAK, 3Space), and upper body kinematics (video) were recorded while the participants performed the exercises. An EMG-driven model was used to estimate spinal loading. Two-way repeated measures analyses of variance (ANOVA) were used (α=0.05). The surface main effect and surface-exercise interactions were reported since the objective of this work was to assess surface type. A Least Square Means test was used to decipher surface-exercise interactions.

RESULTS AND DISCUSSION

Co-contraction of trunk flexor and extensor muscles was reduced by 30.4% and 9.5% respectively for the contralateral and single leg extension exercises when performed on the ball, but was unchanged for the back extension exercise (Figure 1).

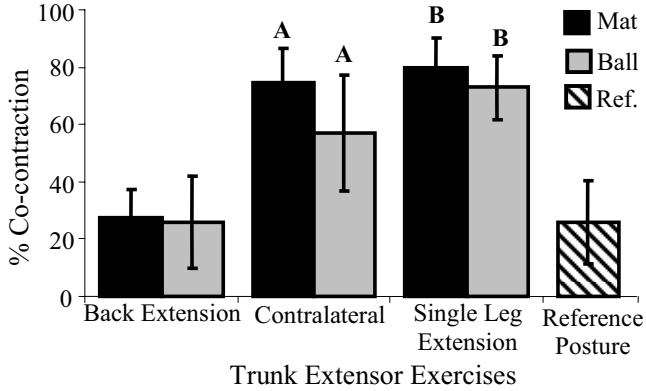

Figure 1: Percent peak co-contraction between left and right trunk flexors (RA, EO, and IO muscles), and trunk extensors (TES, LES, and MULT muscles).

The peak lumbar extension and range of lateral bend and axial twist postures attained during the exercises did not differ between surfaces. Lower spinal loading (compression and anterior-posterior shear) was observed on the ball (Figure 2). Peak muscle activation remained unchanged or decreased when the extension exercises were performed on the exercise ball. The magnitude of muscle activation for the exercises performed on the surfaces were similar to literature values [2,3]. The assumption that the use of an exercise ball will always create a greater challenge for the musculoskeletal system was not supported by the findings of this study.

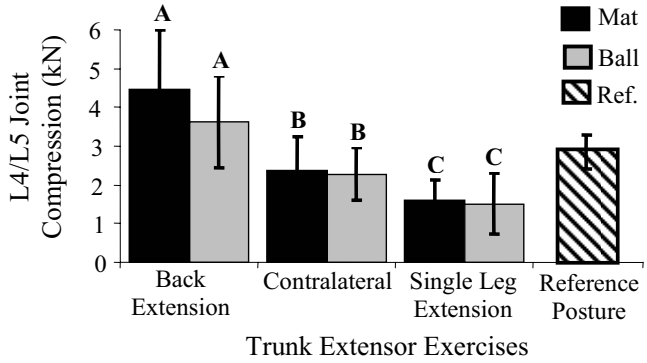

Figure 2: Mean EMG-driven model estimates of maximum L4/L5 joint compression across the participants (N = 8). The significant differences between surfaces for each exercise are indicated with the same letter.

CONCLUSIONS

In a healthy young population there does not appear to be any training advantage to performing extensor exercises on an exercise ball versus a floor surface. However in a rehabilitation scenario, these exercises performed on a ball could reduce low back loading and hence the potential for re-injury would be reduced. Those desiring exercises that elicit high levels of muscle activation and co-contraction can obtain the same or higher levels by performing these trunk extensor exercises on a mat.

REFERENCES

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