INTRODUCTION
Promoting a more neutral sitting posture has become a commonly targeted aspect of ergonomic seat design. Strategies to impart more extension to the low back can be summarized by the following three strategies: specialized thoracic supports (allowing scapular retraction), anterior tilting seat pans, and lumbar supports. Lumbar supports attempt to alter posture by applying forces directly to the low back. The other approaches aim to indirectly impact lumbar spine posture by altering the orientation of the thoracic vertebrae above or the pelvis below the lumbar spine. While there is support in the literature for some of these features to impact lumbar postures in isolation [1,2], currently no direct comparison exists. The purpose of this study was to determine whether one design strategy is superior for improving the lumbar lordosis and pelvic tilt angles in sitting.

METHODS
Five subjects, recruited from a student population, were radiographed in 6 postures: standing, maximum flexion (maxflex) and sitting in an office chair specifically designed for this study with 4 different configurations: control (backrest angle fixed at 100°, seat pan fixed at 0°), pelvic tilt (seat pan rotated anteriorly 10° with no backrest), scapular relief (backrest support along midline of spine, cut out through the area of the scapulae) and lumbar support (prominence of 4cm). Radiographic measures of lumbar lordosis (LL) and sacral tilt (ST) were measured from the radiographs. A 2-way ANOVA (repeated measures of posture by gender) with a level of significance p ≤ 0.05 was conducted. Fisher’s Least Significant Difference post hoc test was used on all significant main effects.

RESULTS
A significant main effect of posture was found for both lumbar lordosis (<0.001) and sacral tilt (0.0012) measures. Lumbar lordosis was significantly greater (less flexion) and sacral tilt was significantly more anteriorly rotated in standing compared to the rest of the postures: maxflex (LL p<0.0001, ST p=0.0025), pelvic tilt (LL p=0.0008, ST p=0.0282), control (LL p=0.0004, ST p=0.0024) scapular relief (LL p=0.0004, ST p=0.0030) or lumbar support (LL p=0.0026, ST p=0.0066). There were no significant differences between the maxflex posture and all seated conditions for both lumbar lordosis and sacral tilt measures: pelvic tilt (LL p=0.7634, ST p=0.7998), control (LL p=0.9402, ST p=1.0000) scapular relief (LL p=0.9132, ST p=1.000) or lumbar support (LL p=0.4001, ST p=0.9953). No significant differences were found between seated conditions. The main effect of gender was not significant for any of the measures and there were no interactions between gender and posture.

DISCUSSION & CONCLUSIONS
The low back and pelvic posture remains significantly flexed in sitting, close to the voluntary end range, even when features designed to impart extension to the low back are engaged. While not achieving statistical significance, the lumbar support condition appears to have the greatest impact on the lumbar lordosis measure and the seat pan tilt condition has the greatest impact on the sacral tilt measure.

REFERENCES

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