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Sagittal Range of Motion of the Thoracic Spine Using Inertial Tracking Device and Effect of Measurement Errors on Model Predictions

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ABSTRACT

Range of motion (ROM) of the thoracic spine has implications in patient discrimination for diagnostic purposes and in biomechanical models for predictions of spinal loads. Few previous studies have reported quite different thoracic ROMs. Total (T1-T12), lower (T5-T12) and upper (T1-T5) thoracic, lumbar (T12-S1), pelvis, and entire trunk (T1) ROMs were measured using an inertial tracking device as asymptomatic subjects flexed forward from their neutral upright position to full forward flexion. **Correlations between body height and the ROMs were conducted.** **Effect** of measurement errors of the trunk flexion (T1) on the model-predicted spinal loads **was** investigated. Mean of peak voluntary total flexion of trunk (T1) was $118.4 \pm 13.9^\circ$, of which $20.5 \pm 6.5^\circ$ was generated by flexion of the T1 to T12 (thoracic ROM), and the remaining by flexion of the T12 to S1 (lumbar ROM) ($50.2 \pm 7.0^\circ$) and pelvis ($47.8 \pm 6.9^\circ$). Lower thoracic ROM was significantly larger than upper thoracic ROM ($14.8 \pm 5.4^\circ$ versus $5.8 \pm 3.1^\circ$). **There**

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