CNS 2018 ANNUAL MEETING
HOUSTON, TEXAS
OCTOBER 6-10, 2018

Variations in Kinematics During Lumbar Flexion/Extension Bending: A Comparison of Bending Techniques

Tyler Donahue; Caleb Williams; sam wilson; Ken Walker; chip Wade PhD
Department of Health, Exercsie Science, and Recreational Managment, University of Mississippi
OrthoKinematics, Austin TX
Department of Industrial and Systems Engineering, Auburn University

ortho KINEMATICS
revolutionizing spine motion analysis

Introduction

The current standard of care for function assessment of the lumbar spine focuses on uncontrolled patient directed motion which results in increased inter-patient variability. Panjabi suggested the variability in the voluntary efforts of the patients to produce spinal motion and the lack of standardized testing methodologies present challenges to the clinical efficiency and uncertainty around data garnered during standard flexion/extension (FE) imaging. The current study compares lumbar, pelvis, and hip kinematics between patient bending techniques.

Methods

8 healthy participants completed a 3 series of 8 flexion-neutral bends and 8 extension-neutral bends. The first series (untrained) were conducted by the participant with no instructions on how to complete the bending, other than they are to bending when told to. The second series (trained) were conducted by the participant following a set of instructions by a radiology technician describing both standing posture and instructions on how to bend. The third series (bolstered) was conducted with the patients standing in a patient handling device (VMA-XR Bolster, Ortho Kinematics, Austin, TX) which restricted motion of the pelvis by bolstering the posterior and anterior iliac crest. An eight T-20-camera Vicon ® Nexus motion measurement system recorded 3 dimensional joint motion data. Motion at the knee, hip, pelvis, lumbar segment, and shoulders complex were measured.

Results

Analysis revealed significant kinematic variability between untrained and trained bending, untrained and bolster bending, and trained and bolstered bending. The greatest differences were between the untrained and the other conditions. Knee and hip flexion/extension ROM were significantly greater in the untrained bending than other conditions. Knee and hip flexion/extension ROM were significantly reduced while pelvis and lumbar ROM were significantly increased in trained and bolstered compared to untrained. The increases in pelvis and lumbar ROM were greater in bolstered than untrained.

Learning Objectives

Imaging protocols including bending methodologies play an important role in accurate motion data for lumbar spine imaging

References

Conclusions

These results suggest bolstered and trained bending play an important role in providing accurate measures of lumbar spine anatomy during imaging.