

## ALTERED THREE-DIMENSIONAL TRUNK AND HIP KINETICS AND LOSS OF VARIABILITY DURING GAIT IN CHRONIC LOW BACK PAIN INDIVIDUALS

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**Introduction:** According to our best knowledge, studies with CLBP individuals that focused on complex activities, as gait, have limited their analysis to kinematic and electromyographic variables. Additionally, to date kinematic data have been interpreted and discussed without taking into account their error magnitude, which can maximize the risk of over-interpreting small differences between groups as meaningful. This is even more important in gait analysis, since we already know that error values associated with this procedure are generally not small enough to be ignored during the interpretation of clinical data. Further, combining the information on kinematics with multi-trunk kinetics during gait is of importance, since it can create a deeper understanding about the causes of movement pattern changes in CLBP individuals.

Thus, the **aims** of this study are: 1) to determine differences in thoracic, lumbar and hip kinematics and kinetics between CLBP patients and healthy individuals during gait, taking into account the error values; 2) and to gain insight into the variability of movement between thoracic, lumbar and hip segments in association with joint moments, in CLBP patients versus healthy individuals.

**Methods:** In the absence of a clear primary outcome regarding biomechanical parameters and based on the most usual sample sizes, a convenience sample of 19 CLBP individuals and 20 healthy volunteers was respectively recruited from community/outpatient clinics and university staff/associates, according to predefined inclusion/exclusion criteria. Participants walked on barefoot at their preferred speed. Time-distance parameters and joint angles/moments peaks were computed. Step-to-step variability of thoracic, lumbar and hip segments was calculated and correlated to each other. The local Ethics Committee approved the study.

**Results:** In CLBP individuals, the sagittal and transverse planes residual rotations of lumbar were positively correlated in magnitude and negatively correlated in sign with sagittal and frontal planes residual rotations of thoracic segment. A decrease in lumbar/thoracic flexor joint moments and an increase in thoracic axial joint moment were verified in patients.

**Conclusions:** In CLBP group, greater variability in sagittal and transverse planes of lumbar segment was correlated with lower variability in sagittal and frontal planes of the thoracic segment, while in the control group, when significant, higher variability in one segment was mostly correlated with higher variability in the other. The kinetic differences between groups were out of the established SEM values, indicating that trunk joint moments results are not masked by the measurement error. These results reinforce the argument that CLBP patients exhibit a protective movement strategy.

### Keywords

Trunk-pelvis coordination; residual rotation; joint moments; joint angles.