

CHARACTERISTICS OF LUMBAR SPINE AND PELVIS MOVEMENT DURING NORMAL GAIT

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INTRODUCTION: Coordination between the pelvis and lumbar spine is a critical feature of human movement. The purpose of this study was to obtain information on the relations between the movement of the pelvis and lumbar spine.

METHOD: Six healthy young adult men (22.2 ± 2.9 yrs, 173.2 ± 3.6 cm, 64.5 ± 4.5 kg) with no history of low-back pain or neurological or musculoskeletal disorders participated in the study. The subjects were asked to walk barefoot at a self-selected cadence (stride rate = 0.84 ± 0.07 Hz) on an 8-m walkway. An eight-camera motion capture system (MAC3D, Motion Analysis Corporation, USA) was operated at 200 Hz. Markers were attached to the skin over the pelvis and rigs were attached to the skin over the sacrum and the spine at the level of the thoraco-lumbar junction (Whittle & Levine, 1997).

RESULTS AND DISCUSSION: In the transverse plane, rotation of the pelvis and axial rotation of the lumbar spine were strongly related during walking. At initial contact of the right foot, the pelvis rotated toward the line of progression, with the right side forward. The lumbar spine had a corresponding rotation to the right (Figure 1). The instant of movement reversal point from the left to right was significantly different for the two locations (pelvis = $52.3 \pm 4.7\%$; lumbar spine = $62.5 \pm 12.7\%$, $p < 0.05$). These findings suggest that activation of the muscles controlling these two displacements proceeds in a longitudinal direction from the legs to the pelvis during normal gait.

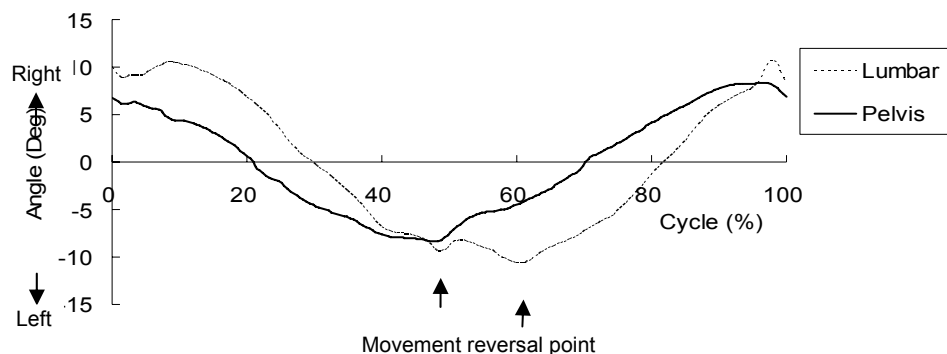


Figure 1. A Representative Example of Pelvic Rotation (Solid Line) and Lumbar Spine Axial Rotation (Dotted Line) in a Transverse Plane During a Single Gait Cycle. The Graph Extends from Right Initial Contact to the Following Right Initial Contact. Angle 0 Corresponds to the Position When the Subject Stands with both Feet Together.

CONCLUSION: Rotation of the pelvis precedes the axial rotation of the lumbar spine. Rehabilitation programs that address the lumbar spine should emphasize the correct movement of the pelvis movement during walking.

REFERENCES:

Whittle, MW. & Levine, D. (1997). Measurement of lumbar lordosis as a component of clinical gait analysis. *Gait and Posture*, 5, 101-107.