

# THE EFFECT OF CHRONIC LOW BACK PAIN ON THREE-DIMENSIONAL PELVIC AND SPINAL KINEMATICS DURING OVERGROUND WALKING

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## **Purpose**

To explore the effects of Chronic low back pain (CLBP) on lumbar and pelvic kinematics during overground walking at self-selected slow and fast speeds. To identify measurement parameters which might aid the planning and evaluation of rehabilitation.

## **Relevance**

Previous studies have reported altered pelvis-thorax co-ordination during treadmill walking in CLBP patients and an increase in stride-to-stride variability of pelvic and thoracic kinematics. To our knowledge, this is the first study to report lumbar kinematics in all planes during overground walking in CLBP patients from a rehabilitation setting.

## **Methods**

Pelvic and lumbar kinematics during walking were compared in seventeen participants with non-specific CLBP and 20 healthy participants without LBP. An optoelectronic 3-dimensional measurement system was used to measure the patterns and amplitudes of lumbar and pelvic kinematics during walking at self-selected normal and fast speeds.

## **Analysis**

Independent student's t tests and Mann-Whitney U tests were used as appropriate to compare walking speed and the peak-to-peak pelvic and lumbar amplitudes of the CLBP and control groups. Paired student's t tests or Wilcoxon matched pairs tests were used to examine the effect of increased walking speed on peak-to-peak amplitudes in each group.

## **Results**

There were no statistically significant differences in walking speeds between the groups. Both groups demonstrated increases in peak-to-peak pelvic and spinal amplitudes in all planes in response to increased walking speed. At self-selected normal walking speed the CLBP group demonstrated a statistically significant reduction in peak-to-peak range of pelvic side flexion ( $p=0.003$ ) compared to the control group. This was also present at self-selected fast walking speed ( $p=0.025$ ), and at fast speed the CLBP group also demonstrated a reduction in peak-to-peak range of lumbar flexion ( $p=0.004$ ). Neither CLBP nor increased speed affected the overall patterns of pelvic and lumbar kinematics.

## **Implications**

The reductions in pelvic and lumbar kinematics may represent an attempt by CLBP patients to stabilise the spine, most noticeable at fast walking speed. This supports previous conclusions drawn from the studies on altered pelvis-thorax co-ordination, and suggests that rehabilitation should aim to optimise spinal stability. Measuring altered kinematics might identify patients who would most benefit from this approach, and rehabilitation could be evaluated in terms of the effect on the altered kinematics. However, investigation of appropriate measurement tools for use in a rehabilitation setting would be required.

## **Keywords:**

Chronic low back pain, walking, kinematics