

# KNEE JOINT BIOMECHANICS DURING STAIR DESCENT IN PATIENTS WITH KNEE OSTEOARTHRITIS VS. CONTROLS

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## Abstract

**Objective:** The aim of the study was to investigate biomechanical differences at the knee between knee osteoarthritis (OA) and healthy control participants during stair descent.

**Methods:** Thirty male and female participants ( $58.9 \pm 7.7$  years) with patellofemoral and medial tibiofemoral OA and thirty age- and BMI-matched control participants were recruited. Participants descended a 7-step staircase at a standardised speed. Kinematic data were obtained by tracking the movement of rigid clusters and markers using a 10-camera motion analysis system (Vicon) and a modified 6 degrees of freedom full body model. Ground reaction forces (GRF) were measured from force platforms embedded into 4 steps. Joint moments were calculated through inverse dynamics techniques by combining kinematic and GRF data. Pain was assessed using a visual analogue scale. An independent t-test was used to test for differences between groups. Values are means  $\pm$  SD.

**Results:** The OA group had a significantly reduced minimal knee flexion angle [OA:  $13.0 \pm 3.3^\circ$ ; control:  $16.4 \pm 3.5^\circ$ ] and internal peak knee extension moment [OA:  $0.96 \pm 0.23$  Nm/kg; control:  $1.16 \pm 0.19$  Nm/kg] during the stance phase compared to controls. Additionally, compared to controls during the stance phase, the OA group had a significantly increased maximal knee adduction angle [OA:  $5.9 \pm 5.8^\circ$ ; control:  $2.8 \pm 5.2^\circ$ ]. The OA group descended stairs in significantly more pain [OA:  $32 \pm 29$  mm on a 0-100 VAS; control:  $0 \pm 0$  mm], at a slower gait speed [OA:  $0.49 \pm 0.06$  m/s; control:  $0.52 \pm 0.03$  m/s] and with a wider stride width [OA:  $0.15 \pm 0.02$  m; control:  $0.14 \pm 0.03$  m] compared to controls.

**Conclusions:** Stair descent is a challenging activity for people with knee OA affecting knee biomechanics as proven by our findings of a reduced knee flexion, increased knee adduction, lower knee extension moment, slower pace and wider stride width, which may all together be results of the pathology while experiencing more pain during the task.

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