

THE KNEE OSTEOARTHRITIS WALKING SCORE: A CLINICAL EVALUATION TOOL FOR KNEE OSTEOARTHRITIS

Matthew Baker, J Moreside, Glen Richardson, Nathan Urquhart, William Stanish,
Derek Rutherford

BIOMEDICAL ENGINEERING

BACKGROUND: Patient-reported outcomes influence clinical evaluations of knee osteoarthritis (OA). Walking difficulties are associated with OA, with research reporting alterations to knee biomechanics and muscle activation associated with increasing OA severity. Therefore, the purpose is to develop a multivariate Knee Osteoarthritis Waling Score (KNOWS), with the ability to discriminate populations with symptomatic moderate knee OA from asymptomatic participants using objective measures of knee function.

METHODS: Walking assessments were completed on 201 participants with knee/hip pathologies and asymptomatic controls (n=402 knees). Joint moments were calculated on those where knee joint centers and ground reaction forces were collected, while knee motion and medial and lateral hamstring activation was measured on all 402 knees. Visual assessment of knee motion, moments and muscle activation waveforms was completed across all groups. Four factors were identified and used in a multiple linear regression model to determine a KNOWS based on group assignment. Multiple t-tests were used to determine statistical differences between asymptomatic right and left legs and symptomatic OA knees. A Linear Discriminant Analysis was completed to determine correct group classification.

RESULTS: Sagittal and frontal plane moment features, hamstring activation and participant mass were used as factors in the KNOWS. A significant difference ($p < 0.001$) was found between the symptomatic OA knee ($\bar{x}=5.5$, $s_x=2.4$) and the asymptomatic group ($\bar{x}=2.2$, $s_x=2.4$) with a large effect size (Cohens $d=1.3$). The Linear Discriminant Analysis showed a 78% correct group classification.

CONCLUSION: Using treadmill-based gait waveforms, a multivariate KNOWS was developed. KNOWS has the potential to enhance the current knee OA decision making process with an objective evaluation of knee function.