INTRODUCTION
Knee osteoarthritis (OA) can be classified as primary (non-traumatic) or secondary (post-traumatic). Variations in radiological features exist between these knee OA classifications [1]. Differences in gait mechanics have not been investigated and this information may provide knowledge about the role of gait in OA initiation and progression. The purpose was to compare gait kinematics and kinetics between patients with primary and secondary knee OA.

METHODS
Participants with medial compartment knee OA undergoing knee osteotomy with arthroscopic surgery were classified as primary (n=122, 36 women) or secondary (n=107, 22 women) based on evidence of previous trauma (e.g. ligament rupture). They underwent radiographs to determine OA severity.

Prior to surgery, participants underwent a gait assessment consisting of five walking trials at self-selected speeds. Data were collected using 22 reflective markers, an 8 camera motion analysis system (Motion Analysis Corporation) sampled at 60 Hz, and a force plate (Advanced Mechanical Technology Inc) sampled at 1200 Hz.

Commercial software was used for data processing (EvART™ and Orthotrak™, Motion Analysis Corporation). Kinematic and kinetic gait waveforms were calculated including sagittal and frontal knee angles and moments. Moments were calculated using inverse dynamics. Discrete parameters (e.g. peak values) were chosen from the waveforms for further analysis. Principal component analysis was also performed for each angle and moment to reduce the dimensionality of the waveform data. Three principal patterns were produced for each angle or moment and these capture temporal and amplitude characteristics of the waveforms. Individual waveforms were then scored against the principal patterns to produce PP-scores.

Independent t-test or Mann-Whitney U tests compared group descriptors (e.g. age, body mass index, radiographic disease severity, and gait speed), discrete gait parameters and PP-scores. Additionally, regression analyses examined if OA classification (primary vs. secondary) could predict the discrete gait parameters and PP-scores after controlling for significant group descriptors. Statistical significant was set at p<0.05.

RESULTS
The primary knee OA group (age 49 years, speed 1.08 m/s) was significantly older, ambulated at slower speeds, and had greater radiographic disease severity than the secondary knee OA group (age 41 years, speed 1.14 m/s). Significant differences were present in all knee angles and moments. After controlling for group descriptors, only discrete measures and PP-scores from the frontal (adduction) angle and moment were explained by OA classification. The primary knee OA group had significantly (p<0.05) higher adduction angles during stance and a significantly higher peak adduction moment (3.40 %BW*Ht) than the secondary knee OA group (2.96 %BW*Ht) (Figure 1).

DISCUSSION & CONCLUSIONS
Gait mechanics differ between patients with primary and secondary knee OA. The primary knee OA group had higher knee adduction angles and moments. These waveforms are risk factors for knee OA progression [2] and likely play more prominent roles in OA development and progression in patients with primary knee OA. A history of trauma is the key risk factor for knee OA development in patients with secondary knee OA.

These gait differences should also be considered when planning future studies including intervention studies. These groups have distinct gait characteristics which should be addressed with inclusion/exclusion criteria or subgroup analyses. Future studies are needed to compare longitudinal change in gait mechanics in primary and secondary knee OA groups and determine how differences influence the disease.

REFERENCES

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