INTRODUCTION
The external joints built into knee braces are designed to be reasonably compatible with joint motion, but the main purposes of the braces themselves are to provide stability or to restrict the motion. There are several advantages to accurate reproduction of knee motion in an external joint assembly such as a knee brace, including reduction of pistoning forces, better ligament protection and kinematic compatibility (Walker, 1985).

The study of geometry and kinematics of the normal human knee can provide results applied to external joint design of knee orthoses (Walker, 1985). As such, some studies aimed at determining the congruence of the instantaneous anatomical knee joint axis and a knee orthosis joint axis (Niesche, 2008).

The objective of this study was to evaluate the effect of a custom made knee brace, in which hinges reproducing the three-dimensional motion of the tibio-femoral joint in 6 degrees of freedom is built, on three dimensional kinematics and kinetics characteristics of the lower extremity during normal walking in osteoarthritic patients.

METHOD
Eight subjects affected by osteoarthritis participated in this study (6 men and 2 women). All subjects received a custom made knee orthosis and completed an adaptation period between the delivery of the orthosis and the experiment.

Kinematic data were acquired using a VICON Motion Capture System with 18 cameras filming gait trials at 100 Hz. Kinetic data were measured with an AMTI force-plate located at the center of a 12 meters gait path at a sampling rate of 2000 Hz.

Participants were asked to walk normally on the gait path for 10 trials without the orthosis and 10 trials with the orthosis.

Paired t-tests were realized to assess differences between the average of the 10 walking trials realized with and without the knee orthosis.

Bonferroni corrections were applied following the paired t-tests to counteract multiple comparisons. Reported significant differences showed p<0.001.

RESULTS
With the use of the orthosis, we observed at the hip a decrease of the peak abduction moment, an increase of the peak abduction angle and a decrease of the peak external rotation angle. A decrease of knee peak flexion angle was also found with the use of the orthosis (figure 1).

DISCUSSION
The net moment at the injured knee (moment of the orthosis added to the knee moment) was relatively similar to the net knee moment at the uninjured knee, indicating a normalizing effect of the orthosis.

Further studies would be needed to quantify the forces transmitted by the orthosis to the lower limb and estimate the contribution of the orthosis to the net moment of the injured knee.

CONCLUSION
More results will be needed to further verify the effect of the knee orthosis on lower limb biomechanics.

CLINICAL APPLICATIONS
This study provided preliminary data on the effect of a knee brace which reproduces the three-dimensional motion of the tibio-femoral joint.

REFERENCES