INTRODUCTION
One common indication for ankle foot orthoses is foot drop, which occurs when the foot can no longer be actively dorsiflexed due to muscular weakness or paralysis. Often seen in pathologies such as stroke and spinal cord injury, footdrop affects both swing and stance phases of gait. Posterior Leaf Spring AFOs are commonly used to treat footdrop by both clearing the toes during swing and controlling plantarflexion (PF) during landing response to reduce foot slap. Resistance to dorsiflexion (DF) and PF in PLS AFOs has been shown to decrease almost proportionally to reduction in posterior strut width (Sumiya et al. 1996), however no standard for PLS trimlines currently exist based on patient presentation (Novachek, 2007). In the previous iteration of this study, different heights, plastic thicknesses, and strut widths of PLS AFOs were shown to achieve similar DF range but significantly different PF range using a motorized ankle device (Keith & Marsh 2015). The purpose of this study was to investigate the effects of posterior strut width on ankle and knee kinetics and kinematics on healthy subjects. It was hypothesized that as posterior strut width decreases, peak DF/PF angles would increase, and peak DF/PF moments and knee flexion/extension moments would decrease.

METHOD

Subjects: 12 subjects, 4 male, 8 female, ages 22-32,
Apparatus: OptiTrack motion analysis system, AMTI force plates, overground walkway
Procedures: We performed a standing trial to establish a baseline for each subject and collected three walking trials with the subjects wearing the PLS for each of the 5 trimline percentages. Trimline percentages tested were from 40% of the malleolar circumference to 20%, decreasing in 5% increments. Ground reaction force, joint angles, and joint moments were collected.
Data Analysis: We used custom MATLAB software to synthesize the force plate data and synchronize it with the camera data. Custom Visual 3D script was used to analyze the processed data. A two way ANOVA was performed with an alpha=0.05.

RESULTS
This study analyzed peak plantar flexion and DF angle, peak plantar flexion and DF moments, and peak knee extension and flexion moments during stance. No statistical significance was found in these measures between subject height or trimline percentage. However, there was a trend that as strut width decreased, ankle range of motion increased.

We also compared our peak values to plus or minus one standard deviation of normal gait. Peak plantar flexion angles remained within the standard deviation from normal, while DF was slightly limited. Values for peak ankle moments during stance were all within the normal gait range. Finally, peak knee flexion moments during gait were decreased while peak extension moments were slightly increased.

DISCUSSION
We rejected the hypothesis that change in strut width or patient height had an effect on peak ankle angles or moments, and peak knee moments during stance. While not significant, a general trend existed in increasing peak angles at the ankle as strut width decreased, effectively allowing more normal gait parameters to be achieved. No undesirable moments at the ankle were observed. Of high clinical importance, there was no significant knee flexion moment at loading response removing the concern of instability. The peak knee flexion response was found to be less than normal gait, while the knee extension moment was greater when compared to normal gait. This would need to be isolated to determine cause.

In the future, we aim to examine how PLS strut width changes affect those with pathological gait, and if a PLS is appropriate for patients with genu recurvatum.

CONCLUSION
For able bodied subjects with normal gait patterns, there is no statistically significant affect on peak angles and moments at the ankle, nor peak moments at the knee, when reducing the trimline from 40-20% of malleolar circumference for short, average, and tall subjects.

CLINICAL APPLICATIONS
The findings further support current clinical indications for a PLS AFO that are common practice. By finding that peak values fall within (or near) one standard deviation of normal gait it can be suggested that the PLS AFO provides assistance during swing phase while having minimal effects on the remainder of the gait cycle. This study also shows that strut widths between 20%-40% of malleolar circumference provide negligible differences at the knee and ankle, and therefore can save time during fabrication and fitting.

REFERENCES
Sumiya, T. POI 20, 132-137, 1996.