

Oral presentation

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## Foot joint pressures during dynamic gait simulation

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### Introduction

Adult acquired flatfoot deformity is a progressive loss of normal function of the entire foot. A limited number of studies concerning joint pressures [1,2] with adult acquired flatfoot exist. Custom orthotics [3,4] are often used for conservative treatment of adult acquired flatfoot.

### Methods

5 fresh cadaveric specimens were connected to a dynamic gait simulator. I-scan #6900 sensors<sup>®</sup> were calibrated and surgically inserted into the subtalar (ST), naviculocuneiform (NC), calcaneocuboid (CC), and talonavicular (TN) joints using a joint spreader. Each foot was walked multiple trials across a force platform for three conditions (normal, flatfoot, flatfoot-orthotic). The flatfoot condition was created by detaching the posterior tibial tendon from

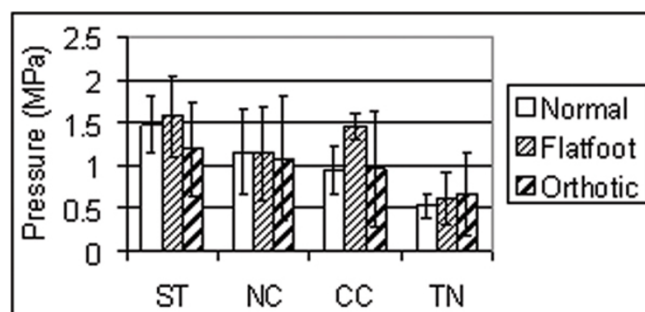
the simulator and surgically releasing the spring ligament complex and the plantar fascia. Joint pressure data were collected at 100 Hz. Peak pressures were averaged within subjects and effect sizes were calculated between conditions.

### Results

Mean joint pressures ranged between 0.5 and 1.5 MPa (Figure 1).

According to Cohen [5], effect sizes of .20, .50 and .80 represent small, medium and large differences, respectively.

Medium and large effect sizes were observed for the ST, NC, and CC joint (Table 1). Compared to the normal condition: ST pressures were lower during the orthotic condition, NC pressures were lower during the flatfoot and orthotic conditions, and CC pressures were higher during the flatfoot condition. Compared to the flatfoot condition: ST, NC, and CC pressures were all lower during the orthotic condition.



**Figure 1**  
Mean joint pressures. Pressures for CC and TN were only available for two feet.

**Table 1: Measurements of effect size**

	ST	NC	CC	TN
Normal vs Flatfoot	-0.43	0.60*	-2.62**	-0.19
Normal vs Orthotic	3.40**	1.26**	-0.46	-0.03
Flatfoot vs Orthotic	2.17**	0.75*	3.96**	0.11

\* medium effect, \*\* large effect.

## Conclusion

Adult acquired flatfoot deformity appears to increase pressure at the CC joint, and slightly decrease pressure at the NC joint. The use of orthotics may be an effective method to reduce joint pressures in both the normal foot and flat-foot. The TN joint does not appear to be substantially affected by flatfoot deformity or the use of orthotics.

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