



# QUANTIFYING PLANTAR PRESSURES OF FOS, UCBLs, AND SMAFOS IN PATIENTS WITH PROBLEMATIC PRONATION

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## INTRODUCTION

Pronation of the foot is normal during early stance phase, but this flattening of the medial longitudinal arch during all phases of gait can lead to deformity and pain. Three commonly used orthoses in the treatment of problematic pronation, or pes planus, include the rigid foot orthosis (FO), the University of California Berkeley Laboratory orthoses (UCBL), and the articulated supramalleolar ankle-foot orthosis (SMAFO). The purpose of this study was to quantify and compare the corrective pressures and comfort level between those three different devices used in the treatment of pes planus. It is hypothesized that the articulated SMAFO has a greater distribution of corrective pressures than the FO and the UCBL leading to less pressure in the medial longitudinal arch and a higher acceptance rate.

## METHOD

**Subjects:** Three adult males with a Foot Posture Index (FPI-6) score greater than 5, indicating abnormal pronation

**Apparatus:** Teckscan's F-Socket and F-scan systems, questionnaire about perceived comfort and support

**Procedures:** Subjects were evaluated using the FPI-6 and casted. Three custom orthoses were made using the same model: articulated SMAFO, UCBL, and FO. The F-Socket sensor and F-Scan sensor were placed on the medial and plantar surfaces of the foot, respectively. Each subject ambulated three times on a 25-foot walkway in each orthosis and a shoe-only condition. The comfort surveys were completed between conditions and after all testing was complete.

**Data Analysis:** The F-Socket sensor was divided into four regions: first metatarsal head, medial border of arch, navicular, and medial malleolus. The F-Scan sensor was divided into six regions: the lateral and medial forefoot, midfoot, and hindfoot. The maximum peak pressure was identified at each trial, and the trials were averaged for each condition. An ANOVA test was then completed.

## RESULTS

No significance was found for any region of the plantar or medial surfaces of the foot. Therefore, each subject was considered individually. Figure 1 is a sample of one subject's data. Table 1 shows the rankings for comfort and support from each subject after testing was complete.

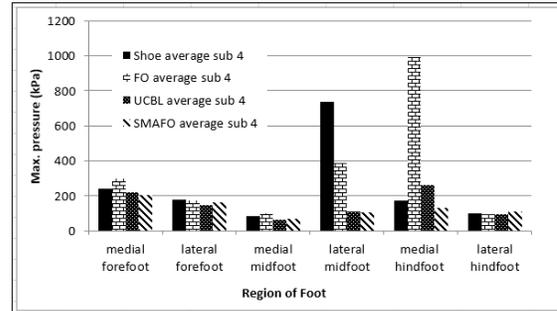


Figure 1. The F-Scan sensor was divided into six regions and the maximum peak pressure for each region in each trial was identified and averaged for Subject 4.

	Most Comfortable	Least Comfortable	Most Supportive	Least Supportive
Sub 3	FO	SMAFO	UCBL	Shoe
Sub 4	Shoe	SMAFO	SMAFO	Shoe
Sub 6	Shoe	SMAFO	UCBL	FO

Table 1. Subjects ranked each orthosis in comfort and support.

## DISCUSSION

The maximum peak pressures in the FO were higher than the UCBL or SMAFO in five of the six regions, and the UCBL showed higher pressure than the SMAFO in three of the six regions, which begins to support the hypothesis. The other two subjects did not follow this same trend, though. All three subjects noted that the orthoses with higher trimlines felt most supportive, but this did not correlate to more comfort.

## CONCLUSION

The SMAFO did not significantly lower the pressures on the medial longitudinal arch. The subjects found the orthoses with higher trimlines were most supportive but least comfortable. Although methods were improved from the pilot study, further research is needed with a larger sample size.

## CLINICAL APPLICATIONS

This study does not indicate any change in clinical practice due to the lack of statistical significance or common trends in subject pressure data.

## REFERENCES

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