Diabetic shoes are designed to reduce pressure on the foot. These designs often lead to less appealing footwear to a fashion conscious person. If such a person needs a diabetic shoe but refuses to wear them, they will continue to be at risk.

Research has shown that as the heel is elevated, forefoot pressures increase. In an effort to solve this problem, a diabetic high heel shoe was designed with components to reduce forefoot loads.

The purpose of this study was to test a novel shoe design that incorporates several features to reduce loads across the forefoot.

**Purpose and Objective**

- Diabetic shoes are designed to reduce pressure on the foot. These designs often lead to less appealing footwear to a fashion conscious person. If such a person needs a diabetic shoe but refuses to wear them, they will continue to be at risk.
- Research has shown that as the heel is elevated, forefoot pressures increase. In an effort to solve this problem, a diabetic high heel shoe was designed with components to reduce forefoot loads.
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**Methods**

Ten female subjects (ave. age 32±10.1) with no foot deformity were tested with 1) control high heel shoe 2) Outsole groove. 3) Outsole bar 4) Insole pad 5) combined modifications. All shoes were identical manufacture with exception of modifications. Subjects walked 6 trials with self selected speed in gait lab and foot-shoe pressures were collected and evaluated.

Gait analysis consisted of an optoelectronic camera system and in-shoe pressure sensors. Subjects were evaluated for gait while wearing each of the five above shoe conditions. Subjects walked at their normal walking speed, fast and then slow speed. Comparisons were performed on runs matched for speed. The primary endpoints for the study were mean forefoot pressure, force, pressure and load impulse. Areas under each section of the foot were evaluated utilizing the manufacturers defined masking algorithms. Pressure and load impulse is defined as the area under the pressure and load graphs during the gait cycle. Significance was determined using Student T-test and ANOVA.

**Results**

There was significant (20%+) reductions in forefoot pressure, with the combined modifications over the control shoe. (p<0.01) (Graph 1) The additive effects of each component appear to be a linear rather than a polynomial equation. Unlike previous research loads across individual metatarsal heads are equally reduced while the loads at the heel are slightly elevated (Graph 3). The impulse was also significantly reduced from 32.6 lb*sec in the control shoe to 7.8 lb*sec in the modified shoe. (p<0.01) (Graph 2)

**Conclusion**

This study demonstrates that a shoe designed to incorporate multiple biomechanical features of off loading, while the number of subjects is small, the dramatic results suggest a larger study should produce even more compelling data.

As heel elevation will always produce elevated forefoot pressures, significant reductions in loads can be achieved using combined outsole and insole modifications. In the event that a diabetic patient refuses to wear extra-depth designed shoes, a shoe with such modifications may still be of value to reduce the likelihood of adverse outcomes.

**References**

1. The effects of increasing foot height on discomfort and pressure. Momento 1990; 9:61
2. The effects of increasing heel height on foot pain and pressure. Foot. 1990; 9:69

Disclosures: The authors hold a patent for the shoe which has been licensed to DJO Global.