

## **Stiffness properties of multiaxis prosthetic feet in the frontal plane and the influence of shoes**

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**INTRODUCTION:** The purpose of this project is to analyze the stiffness properties of multiaxis prosthetic feet in the frontal plane, and analyze the influence on mechanical testing of those feet when a shoe is worn. We hypothesize: (1) Stiffness properties of multiaxis feet in the frontal plane will vary significantly, and the feet will naturally divide into subcategories based on stiffness properties, and (2) Testing with shoes will influence the stiffness properties in the frontal plane of the multiaxis prosthetic foot.

**METHODS:** 6 multiaxis prosthetic feet (including dynamic response/multiaxis feet) were tested on an Instron materials testing machine. The feet underwent cyclic loading to simulate midstance phase of gait, and were loaded onto a range of inclines from 0° to 20°. The tests were repeated with a shoe added to the feet. A SACH foot was also tested for comparison purposes.

**RESULTS:** There was significant variability among the feet when tested barefoot. The SACH foot displayed a lower stiffness than 3 of the multiaxis feet at all inclines. Statistical analysis showed there were natural divisions among the feet according to stiffness data. When the feet were tested with a shoe, the stiffness decreased for all feet in all conditions, although the magnitude of the change varied by foot. Natural divisions among feet were also present when tested with a shoe, but the divisions were different than when tested barefoot.

**DISCUSSION:** The results showed that stiffness properties among multiaxis feet did vary, and the feet did divide themselves naturally. When tested with a shoe, stiffness decreased for all feet in all conditions. Limitations of this study include anonymity of feet, variability of shoes, and small aspect of gait cycle.

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