



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Orthotics and Prosthetics

Development of an Impact Testing Standard for Prosthetic Feet

There is currently no accepted test standard for prosthetic feet to demonstrate durability to impact loading that may be encountered in physically demanding professions. To address this need, researchers from the Minneapolis Veterans Affairs (VA) Health Care System (Minneapolis, MN) built a system to pilot-test the impact resilience of a selection of prosthetic feet marketed for high-activity users (*Nickel et al., in press*).

Impact resilience was assessed for three sets of specimens each of nine prosthetic feet by determining their maximum drop height without failure. The test specimens ($n = 27$) were organized into three sets with different spring categories for particular user masses. Sets A, B, and C were tested with 45.9, 57.8, and 61.5 kg respectively (101, 127, and 135 lbf, respectively) simulating the mass of the user plus an added 22 kg (48 lbf) of worn or carried load and divided by two to represent even load distribution to both legs at impact.

The feet withstood drop heights without failure ranging from 20 to 100 cm. The type of prosthetic foot was found to significantly affect maximum drop height. Effect sizes for comparisons of individual feet range from 0.15 to 3.17 with the median effect size being 0.94, considered a large effect. In conclusion, the system successfully measures impact resilience and is sensitive to foot type. Large effect sizes indicate there are substantial differences between prosthetic feet marketed for active prosthesis users.

This effort is part of the BADER consortium and was supported by the PRORP with strategic alignment to CRM RP/JPC-8.

REFERENCES:

Nickel, E. V., Gregory; Morin, Steve; Koehler-McNicholas, Sara; Hendershot, Brad; Schnall, Barri L.; Gravely, Amy, MA; Kyle Barrons; Mion, Spencer; Hansen, Andrew. (2019). Impact Testing of Prosthetic Feet for High-Activity Prosthesis Users A Pilot Study. *Journal of Prosthetics and Orthotics*.

