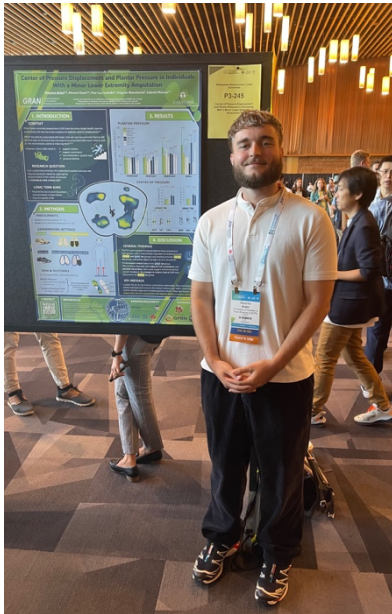




Center of pressure displacement and plantar pressure in individuals with a minor lower extremity amputation



We wanted to know:

Can custom foot orthoses redistribute plantar pressure and improve balance in people with a minor lower extremity amputation?

What is the problem?

Minor lower extremity amputations are becoming increasingly prevalent, particularly among people living with diabetes. While these amputations preserve the foot, they alter the distribution of body weight, which can lead to skin breakdown, ulcer recurrence, and further amputation.

Custom foot orthoses are commonly prescribed to redistribute plantar pressure, but their potential effects on balance in this population remain largely unknown.

How did you study the problem?

We recruited 16 adults with a minor lower extremity amputation and divided them into two groups: with **lesser toe amputations** and with **great toe or more proximal amputations**. Participants completed repeated standing trials while wearing shoes alone or shoes fitted with custom foot orthoses. We measured pressure distribution using pressure insoles and tracked body sway and postural control using force plates.

What did you find?

Custom foot orthoses consistently redistributed plantar pressure in both groups. By supporting the foot arch, they increased mean pressure under the midfoot and reduced pressure under regions at risk for ulceration. Overall, pressure under the rearfoot decreased in both groups, whereas pressure under the forefoot decreased only in participants with lesser toe amputations. Additionally, participants with great toe or more proximal amputations showed a larger contact area. This increase was accompanied by improvements in several measures of standing balance, including reduced center of pressure oscillations and fewer postural corrections. In contrast, participants with lesser toe amputations showed no meaningful changes in balance.

How can this research be used?

Our findings suggest that custom foot orthoses act as mechanical and sensory modulators. From a mechanical standpoint, custom foot orthoses redistribute plantar pressure away from regions at high risk of ulceration. At the same time, by increasing the contact area between the foot and the ground, foot orthoses may enhance plantar sensory feedback, which could improve postural control in some individuals.

These complementary effects could reduce the risk of secondary complications and pain while improving balance and functional mobility in people with minor lower extremity amputations.

Cautions

This study had a small sample size and only evaluated balance while standing quietly with the eyes open. Further research involving larger groups and more functional activities is needed to confirm these findings.

Reference: Acien M., Dami A., Isabelle PL., Blanchette V., Moisan G. Center of pressure displacement and plantar pressure in Individuals with a Minor Lower Extremity Amputation (2026). World Congress of Biomechanics, Vancouver, BC, Canada.

Funding Sources: Canadian MSK Rehab Research Network, The War Amp, Fonds de Recherche du Québec, The Quebec Pain Research Network.

