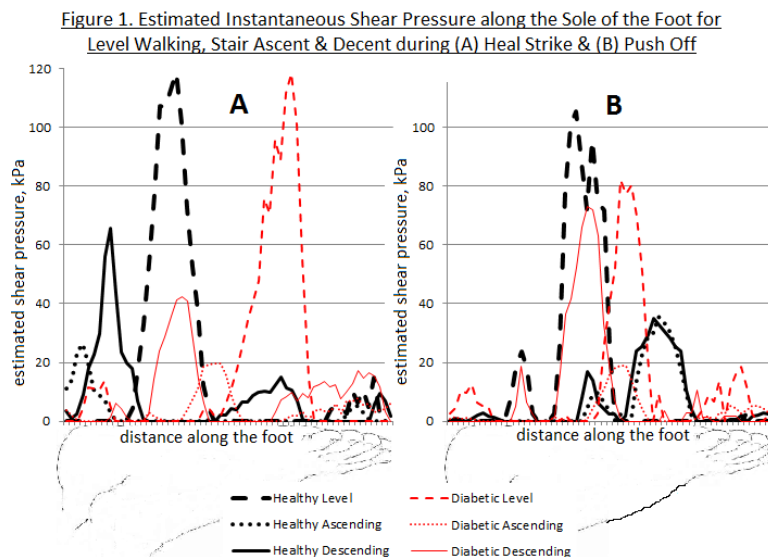


Shear Loading in the Diabetic Foot During Level Walking & Stair Climbing

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Introduction: Risk of diabetic foot ulceration is linked to mechanical loading. Current in-shoe pressure measurement (ISPM) only allows the assessment of vertical and not shear pressures. Although shear pressures cannot currently be measured, they are thought to be a significant contributor to plantar foot ulcers in the diabetic foot. Deriving both normal and shear pressures on the plantar tissue would lead to a better understanding of ulcer formation. **Methods:** Ground reaction force (GRF) and ISPM data were collected during level walking, stair ascent and descent using force plates and ISPM on a representative diabetic patient with severe neuropathy and non-diabetic control. Magnetic resonance imaging (MRI) was used to obtain foot geometry. Shear force/pressure is produced by frictional force between the sole of the foot and the bed of the footwear. Using the principle of Coulomb friction, shear loads can be estimated to be proportional to normal loading. **Results:** Shear loading in the locomotion direction (LD) was estimated from the GRF and ISPM data (Fig. 1).



Conclusion: LD shear pressure is a significant loading parameter with peak values ~120kPa compared to peak vertical pressure values of ~270kPa. This method also shows that ISPM is indicative of the regions of high shear pressure in the LD. Further work is focusing on internal foot pressure using finite element analysis and geometrical information from MRI.