

The concept of the *salfordinsole*[™] research project was to “*create a prefabricated insole with the functional qualities and durability of a professional custom made foot orthosis*”.

The *salfordinsole*[™] and *SureStep-Control*[™] are the product of a two year UK Government Technology Strategy Board sponsored research and development project. The University of Salford partnered with a UK based design and manufacturing company to turn its concept designs into a premium product for use by health professionals worldwide.

Phase 1- Market research

This phase evaluated existing insoles/orthoses used by healthcare professionals and products available direct to consumers. This included speaking to a range of user groups.

Outcomes:

In comparison to custom made foot orthoses:

- The arch profile of many prefabricated insoles is too low to control foot motion.
- Many insoles have little or no heel cup
- The insole materials collapse under minimal load, rendering the arch shape ineffective. Over time the insole loses much of its shape and biomechanical function.
- Top covers come loose and harbour bacteria and dirt.
- Many prefabricated insoles are made in limited sizes ranges (i.e. S/M/L/XL). Consequently, in their design the shape of the arch, heel and forefoot is compromised because the insole has to suit a range of foot sizes.
- The ‘one insole spanning several sizes’ approach requires the use of soft materials so that the insole remains comfortable for each foot size. The combination of compromised shape and use of soft materials means that insoles can offer limited functional control of foot motion.
- As a consequence of compromised geometry, poor quality materials and failure to provide size specific insoles, many existing prefabricated insoles offer little control of foot motion and they offer only short term benefits.

*“By Healthcare professionals,
for Healthcare professionals”*

Phase 2- Development of prototype insole

This phase sought to develop a prototype prefabricated insole with the qualities of a professional custom made foot orthosis and which addressed the shortcomings of existing insoles identified in Phase 1.

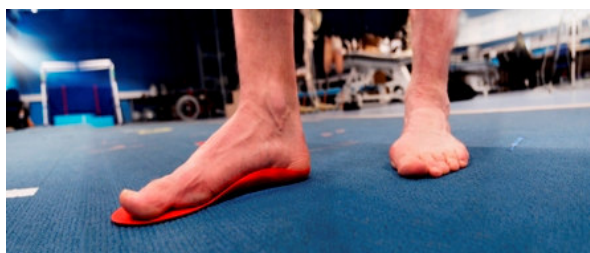
This included a systematic review of foot casts from the University patient base, creation of physical concept designs, prototyping of insole geometry and surfaces, and creating a range of potential new insole materials.

This phase had to meet the challenges of creating an insole with the geometry of a custom foot orthosis but in a form that could be manufactured in a suitably robust material so that the desired biomechanical advantages could be achieved.

Insole geometry was further refined to ensure fit in a range of styles of footwear, from casual footwear, running shoes, to football boots.



Casts were used to create a series of one off prototype insoles for testing. Below, prototype insole in red



Outcomes:

- 3D representations of the heel cup, arch and forefoot geometries of the *salfordinsole*[™]
- Size specific geometric models of the *salfordinsole*[™].
- Prototype *SureStep-Control*[™] material offering equivalent stiffness to high density EVA - with supporting technical data on durability and manufacturing specifications.
- Prototype insole ready for testing with patients (in phase 3)



Phase 3- Insole testing

This phase sought to test the prototype insole in terms of its biomechanical effectiveness and to conduct clinical field trials to ensure it was acceptable to patients.

The insole was tested by researchers at the gait and human performance laboratories at the Centre for Rehabilitation and Human Performance Research at the University of Salford.

The tests involved attaching reflective markers to the leg and foot and measuring the 3D motion of the markers using 10 infra red cameras whilst subjects walked and ran. A biomechanical model was used to calculate the movements of the foot with and without the insole.



This was followed by a range of clinical field tests. The first involved competitive athletes. This community of users were chosen because they were felt to represent a challenging test for the insole. Many athletes have prior experience of either custom or prefabricated foot orthoses and high expectations in terms of comfort and performance. They were asked to assess perceptions of fit, comfort and effectiveness in solving a wide range of injury problems.

In addition, the insole was used in the University of Salford Podiatry clinics for a range of common foot and lower limb problems.

Senior clinical staff at Premiership football clubs and the NHS were also supplied with the prototype insole.

Outcomes:

The insole was found to be very effective in reducing foot pronation. The angle of heel eversion was reduced throughout stance (the foot was less pronated), maximum pronation was reduced, and pronation velocity was also reduced.

The field tests provided strong testimonials in support of the clinical value and comfort of the insole:

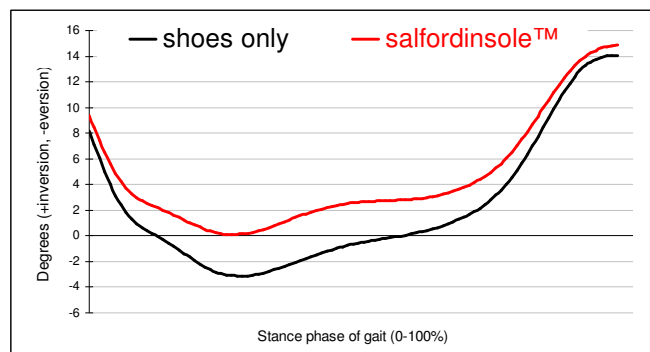
".....[the] insoles were perfect and I'd purchase an extra pair"

"Can't believe that something so simple can make such a huge difference to relieving the pain I was suffering from. "

"I am entirely satisfied with the insoles. It is comfortable and robust. Can be used in different shoes with ease and comfort. The material makes it easy to clean, dry and change to other footwear"

"..[the] insoles have benefited me and my injury. Soon to attempt some hill walking!"

"Can I get another pair? It would save me having to swap between shoes. This has been the first time I have had an improvement in my injury for months."



Reduced pronation throughout stance

See web site for more patient testimonials