Sächsisches Textilforschungsinstitut e.V.

Affiliated institute of the University of Technology Chemnitz

Managing Director: Dr. Heike Illing-Günther
Annaberger Straße 240 | 09125 Chemnitz | Germany I Phone: +49 371 5274-0 | Email: stfi@stfi.de I www.stfi.de

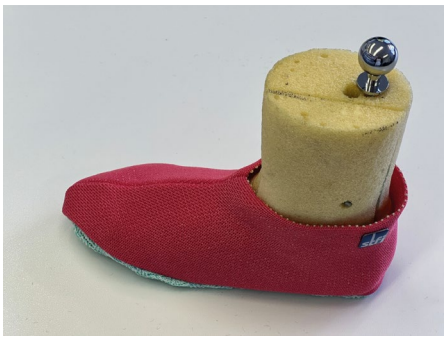
Children's shoe insoles that grow with the child – development of an insole that grows with the child to recognise changes in the fit of the child's shoe

Objective

98% of children are born with healthy feet. In adulthood, however, only 40% of all feet are still healthy. These values apply to the so-called civilised part of the world [1]. Various studies have shown that between 50 % and 85 % of children's shoes do not fit [2] [3] [4]. The aim was to develop a knitting-based production of auxetic structures as textile insoles, which are inserted into a child's shoe and grow with the growing child's foot.

Approach and results

Auxetic structures should be used as the basis for children's shoe insoles. Auxetic structures widen under tensile load, which is contrary to our normal understanding of materials under tensile load. Normally, a material becomes narrower when it is pulled. The focus was on the development of a special binding technique for the production of auxetic structures. These were knitted directly into the sole mould close to the end contour. A knitted support structure ensures that the force exerted by the growing foot acts on all sides of the auxetic sole and thus initiates growth. Furthermore, a test foot was developed as part of the project, which imitates the growing child's foot and was thus able to prove the functionality of the growing children's shoe insole.



Children's shoe with test foot

Auxetic structure (green) as the basis for the sole

Test foot: Enlargement over 3 shoe sizes possible. Shoe size 29 (top), shoe size 32 (below)

With the development of the growing children's shoe insole, the basis for the integration of sensors was created. The sensorisation of the children's shoe insole is to be investigated and implemented in a further research project.

[1] C. J. Bäumer, „Kinderfußfunktion und spätere Haltungsgesundheit des Erwachsenen," Osteopathische MEdizin, pp. 18-23, 2020.
[2] M. Byrne und M. J. Curran, „The development and use of a footwear assessment score in comparing the fit of children's shoes," The Foot, pp. 215-218, 1998.
[3] W. Kinz, E. Groll-Knapp und C. Klein, „Kinder in zu kurzen Schuhen," Pädiatrie & Pädologie, pp. 106-109, 2015.
[4] C. Klein, E. Groll-Knapp, M. Kundi und W. Kinz, „Increased hallux angle in children and its association with insufficient length of footwear: A community based cross-sectional study," BMC Musculoskeletal Disorders, pp. 1-7, 2009.

Acknowledgement

We would like to thank the Federal Ministry for Economic Affairs and Energy for funding the research project "Children's shoe insoles that grow with the child" (Reg. No. 49MF220142) within the funding programme "FuE-Förderung gemeinnütziger externer Industrieforschungseinrichtungen – Innovationskompetenz (INNO-KOM) – Marktorientierte Forschung und Entwicklung (MF)".

INNO-KOM

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

The final report on this project is available on request.

Contact: Dipl.-Phys. Nadine Liebig Phone: +49 371 5274-271 Email: nadine.liebig@stfi.de
Dipl.-Biol. Jens Mählmann Phone: +49 371 5274-240 Email: jens.maehlmann@stfi.de

www.stfi.de

14/05/2025