Call 2021 Topic: New strategies for advanced material-based technologies in health applications

MBrace – Multi-Matrix Composites for Fashionable Customized and Evolveable Braces

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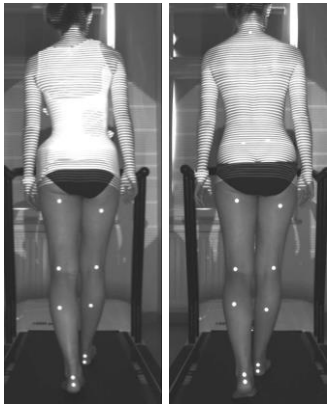
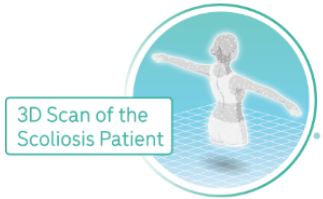
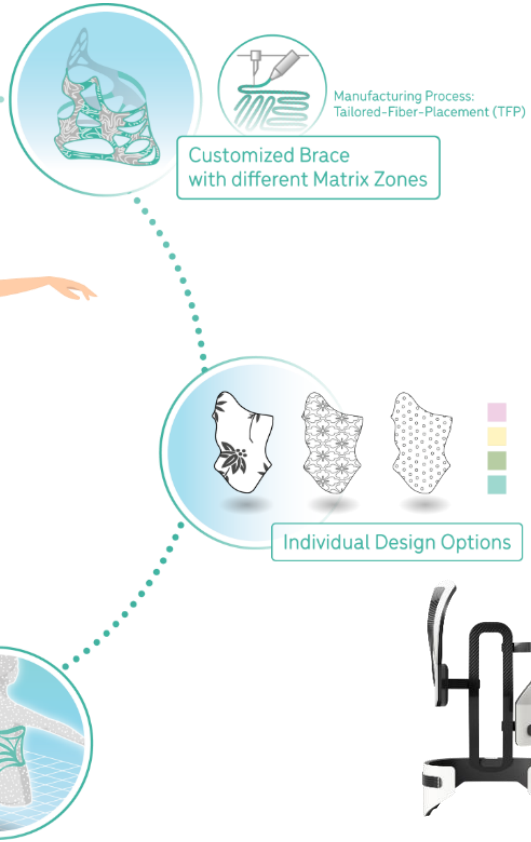
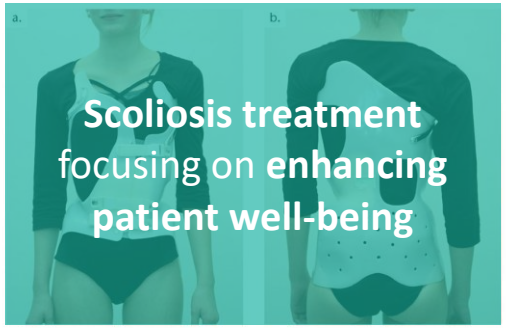
MBrace – Objectives



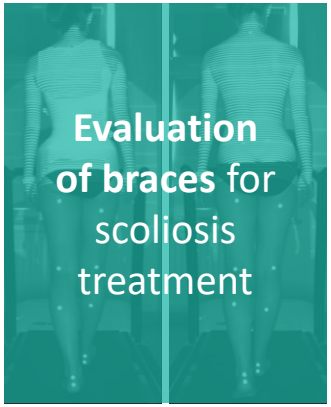




MBrace – Objectives



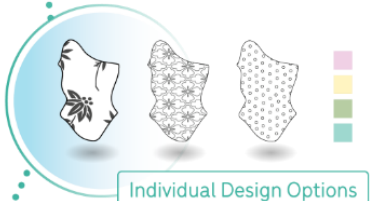
Scoliosis treatment focusing on **enhancing patient well-being**



Evaluation of braces for scoliosis treatment

Manufacturing Process: Tailored-Fiber-Placement (TFP)

Customized Brace with different Matrix Zones



Individual Design Options

3D Scan of the Scoliosis Patient

3D Modelling of the Brace

Material and process development, for mulit-matrix composites with consolidation & shaping

User centered design for more **fashionable,** lightweight and **improve wearing adherence**

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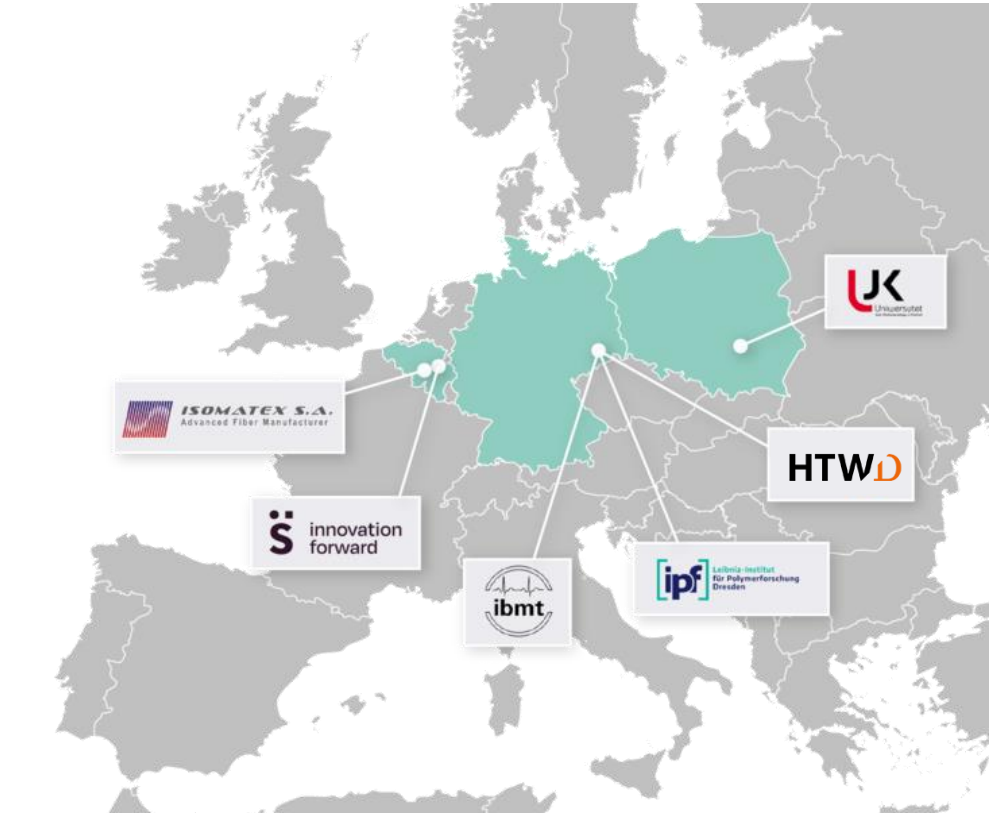
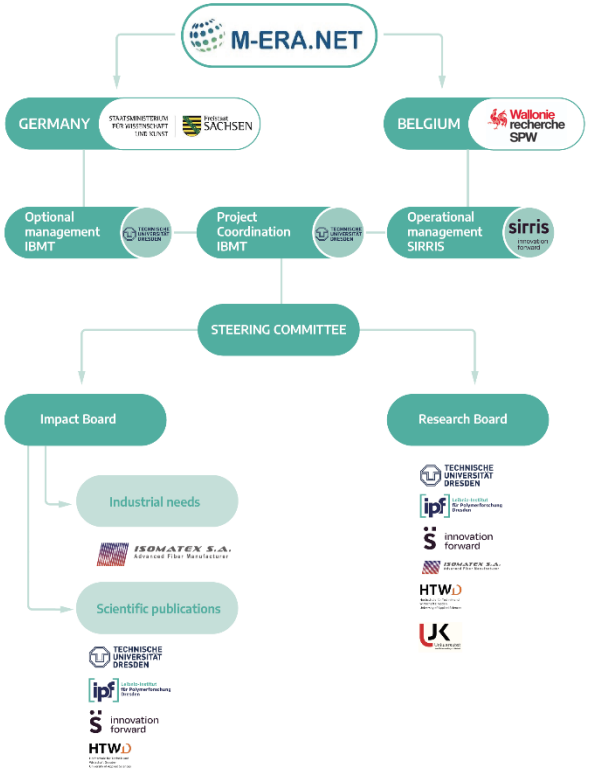
MBrace – Consortium





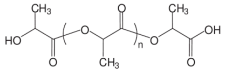
MBrace – Design Finding

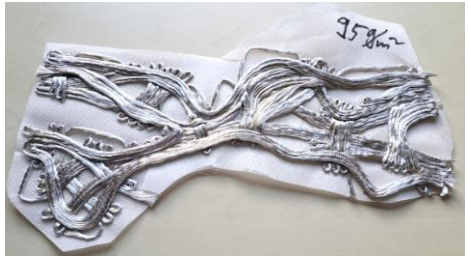
Finding I

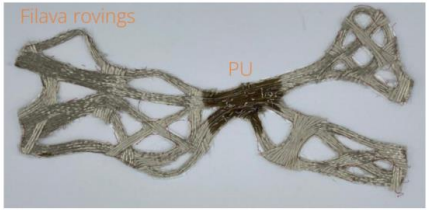
The MBrace-brace consists of **modular frame** of **TFP-parts** for mechanical strength and **custom 3d-printed parts and foam inserts** for high wearing comfort.

MBrace – Material and Process Finding

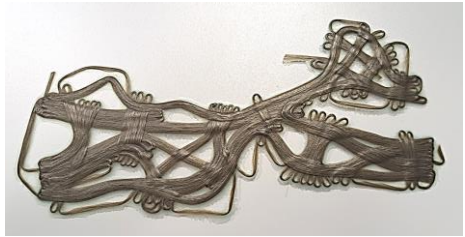
PLA-Filava© hybdrid yarn (biobased)







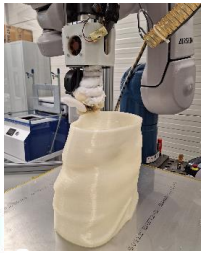
Variable-axial fiber placement (TFP)

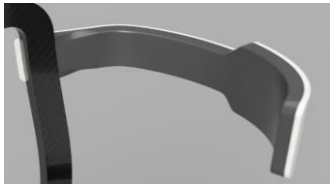


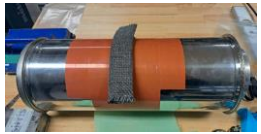
Finding II

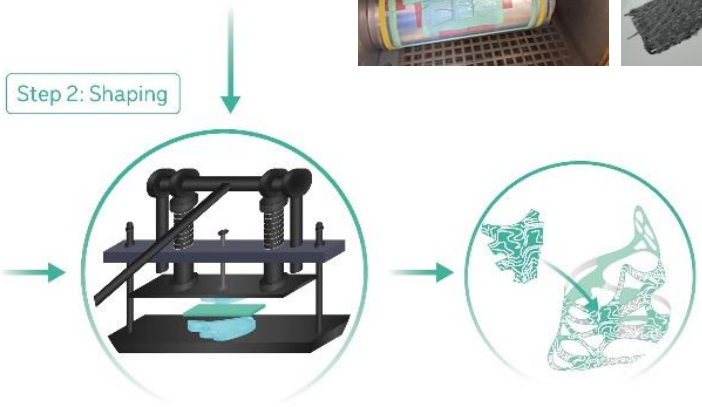
Thermoset (TS) and thermoplastic (TP) composites material offer specific required properties for scoliosis braces design →
TS: adaptable multi-matrix-materials, TP: remoldable.

MBrace – Material and Process Finding









Finding II

Thermoset (TS) and thermoplastic (TP) composites material offer specific required properties for scoliosis braces design →
TS: adaptable multi-matrix-materials, TP: remoldable.

Complex **curved TP-TFP composite segments can be remolded** with 3D-printed rapid prototyped molds.

Final MBrace will be based on detachable and reusable segments.

MBrace – Therapeutic Finding

Biomechanical modelling

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Pedobarography

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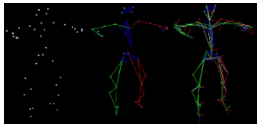
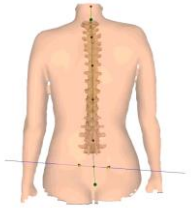
Motion Capture System (OptiTrack, Vicon)



© Vicon Motion Systems Ltd UK

Mixed System

Rasterstereography



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IMU (DIERS free²move)

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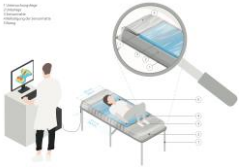
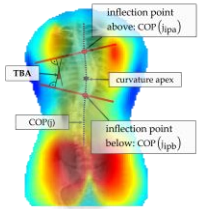
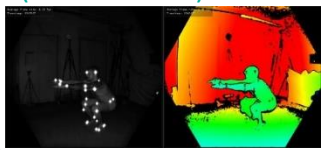
Torsobarography



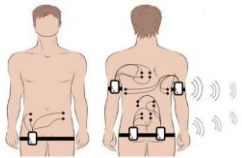


Stecher, N. et al. (2025). Assessing the Diagnostic Validity of Torsobarography in Scoliosis. Preprints. https://doi.org/10.20944/preprints202503.0544.v1

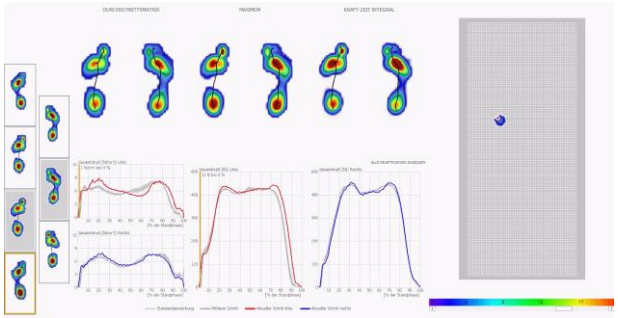
Markerless Motion Capture System (Kinect-Azure)



EMG



MBrace – Therapeutic Finding

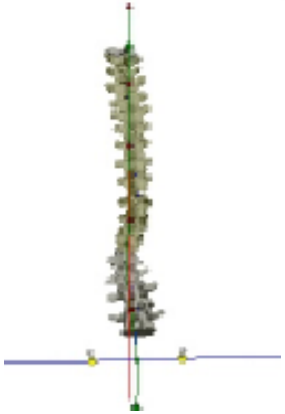


Finding III

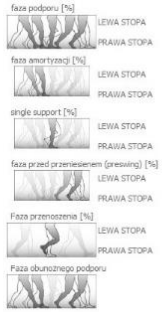
Detection of scoliosis without x-rays: a trained AI model achieves an accuracy of 83%.

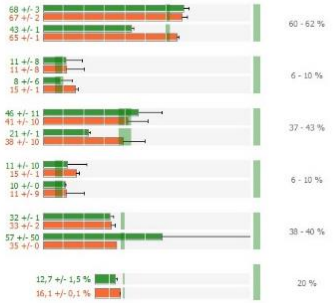
The brace changes the gait pattern by influencing the distribution of foot forces. → Load compensation suggested.

Without corset



Nightly wear of a corset





MBrace – Conclusions I

The newly developed AI algorithms can identify scoliosis without radiographs and use previously neglected gait analysis data to assess the quality of brace fitting.

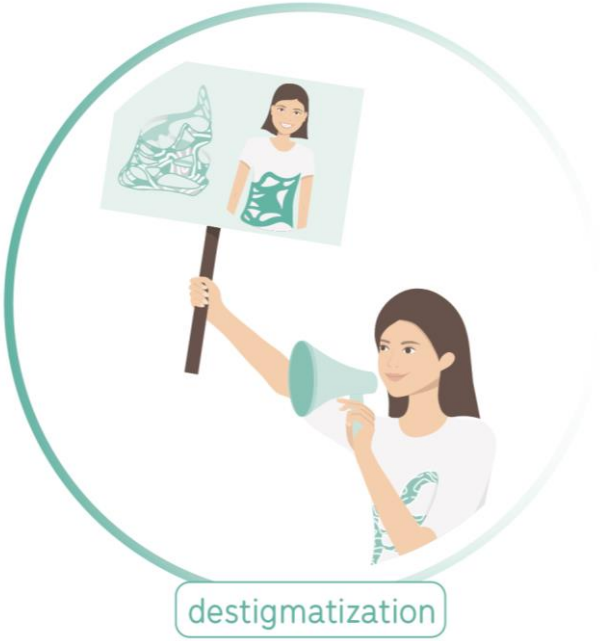
This process allows paediatricians and GPs to detect scoliosis earlier and avoid surgery, and technicians to fit the brace perfectly to young patients.

MBrace – Conclusions II & III

The use of composite materials with adapted properties makes the brace lighter and more comfortable to wear. A non-conservative, fashionable design enhances the user acceptance.

By improving the wear time of the scoliosis brace, treatment success rates will increase.

MBrace – Take Home Message



Raising awareness of scoliosis braces through a more acceptable design, improved wearing comfort and less invasive diagnostics can help destigmatize the subject and improve treatment success.

MBrace – Networking, Workshops & Exhibition

Kick-off meeting, Dresden, Germany, 08/2022

ORD Workshop, DD, 06/2023

COSMO Exhibition ‘Dr. Zukunft’, Dresden, Germany, 10/24 – 02/25

www.m-brace.eu

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POLAND
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