

# Memorthotic

## Individually fitted easily donned compression garments with resilient mechanical properties

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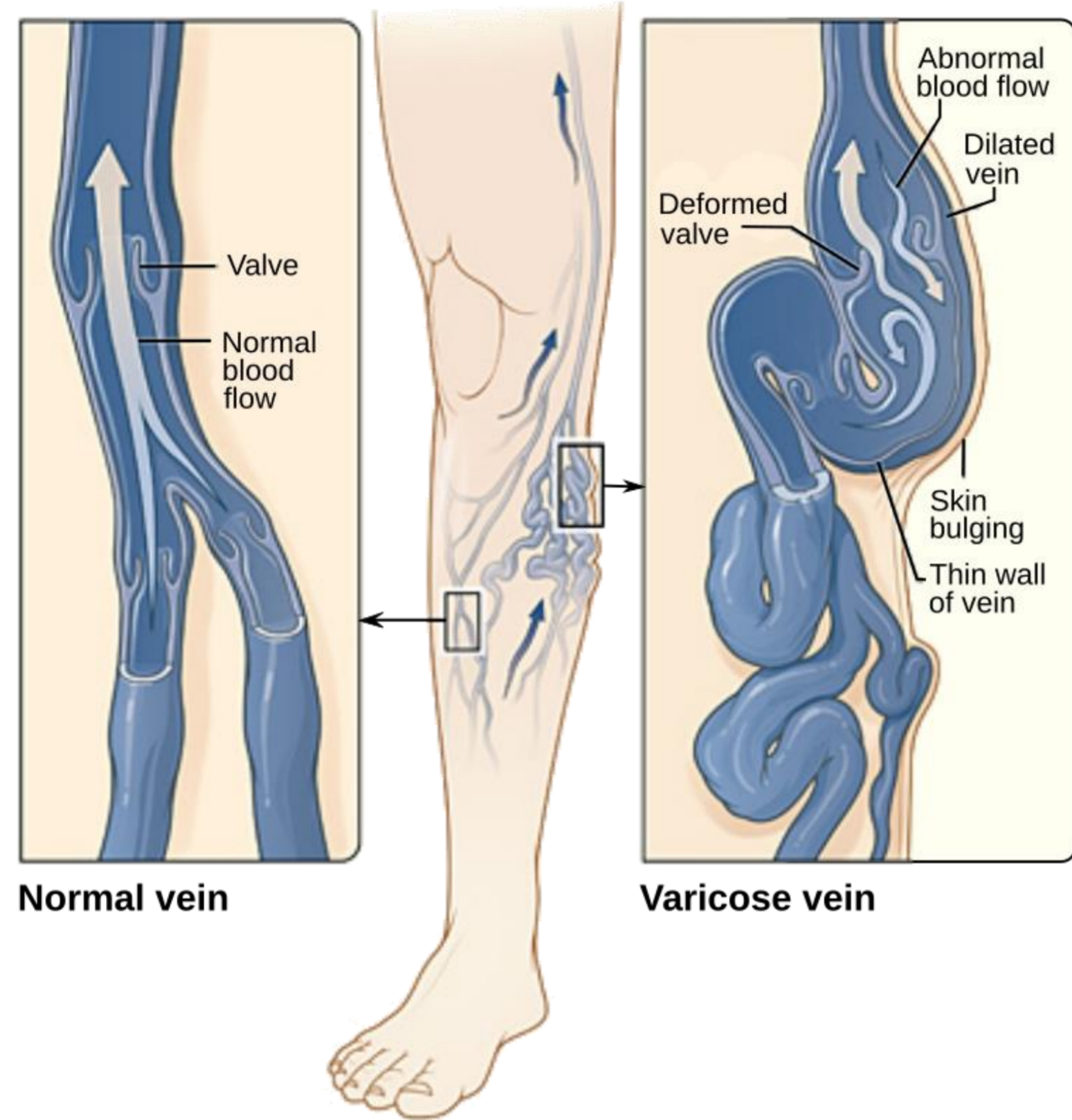
### Abstract

One of the key objectives in POF-IV Program 3 "Material System engineering" Topic 1 "functionality by information-guided design" is transfer of the scientific results to practical applications and development of medical devices. The project Memorthotic aims at validation of shape-memory textiles as materials for compression stockings, whose compression strength and fit, lost in wear, can be fully and repeatedly recovered. In addition, this technology will significantly simplify the donning procedure, rendering patients independent and improving their quality of life. Compression stockings occupy a billion+ size market in Germany. However, the technological basis for compression therapy is decades old and cannot match the requirements of developments in the medicine. The drawbacks in the state-of-the-technology force prescribing physicians and patients to abandon this kind of therapy. Memorthotic offers to integrate polymeric shape-memory fibers into the knitted structure of compression stockings. Shape-memory effect in polymers is an ability of some plastics to recover their memorised shape from a deformed one in a response to an external stimulus, e.g. heating. Memorthotic has its aim to demonstrate that shape-memory compression stockings have an unfair advantage in comparison with all existing manufacturers. Namely, it will be able to overcome the problem of uncontrollable and unpredictable compression strength loss as well as will give an opportunity to simplify the donning for weakened patients by softening the stocking, followed by full recovery of the fit and compression strength once properly donned.

### Problem

#### Varicose veins

Varicose veins are a medical condition in which superficial veins become enlarged and twisted, causing fatigue, pain and can lead to thrombosis and death. (Image: Wikipedia)



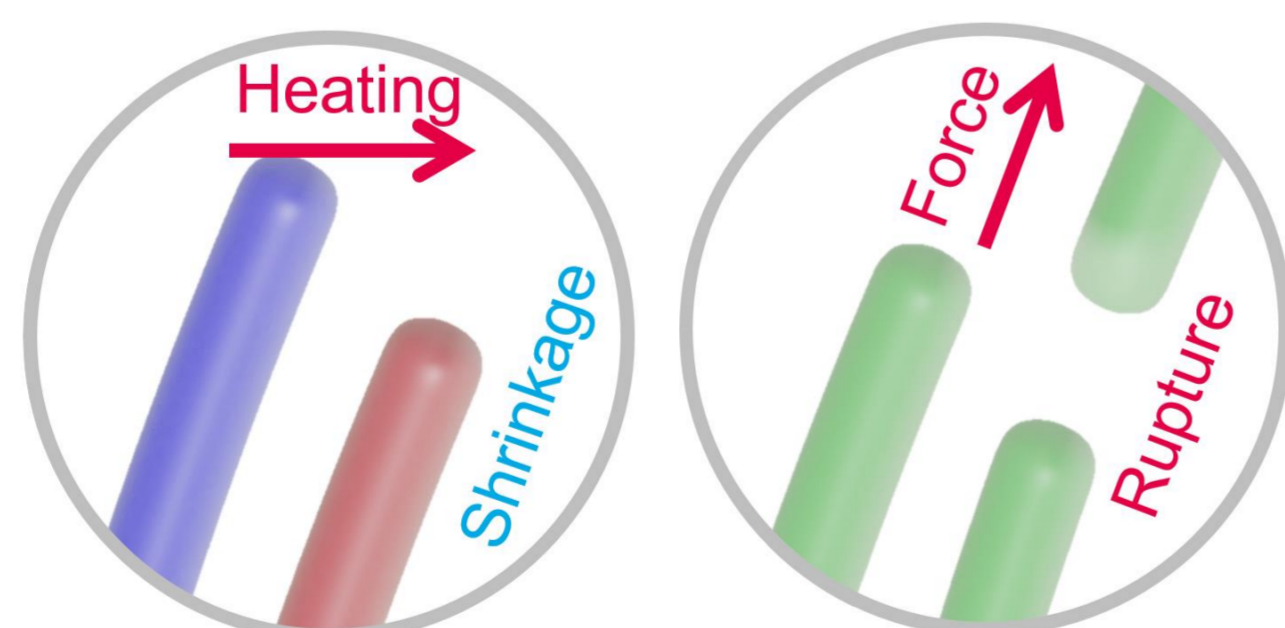
### State-of-the-art solution



#### Compression stockings

Compression stockings are a medical garment that stimulates a proper blood backflow in legs by inflicting gradual compression.

- Fit through elasticity
- Difficult to don
- Irreversible continuous wear

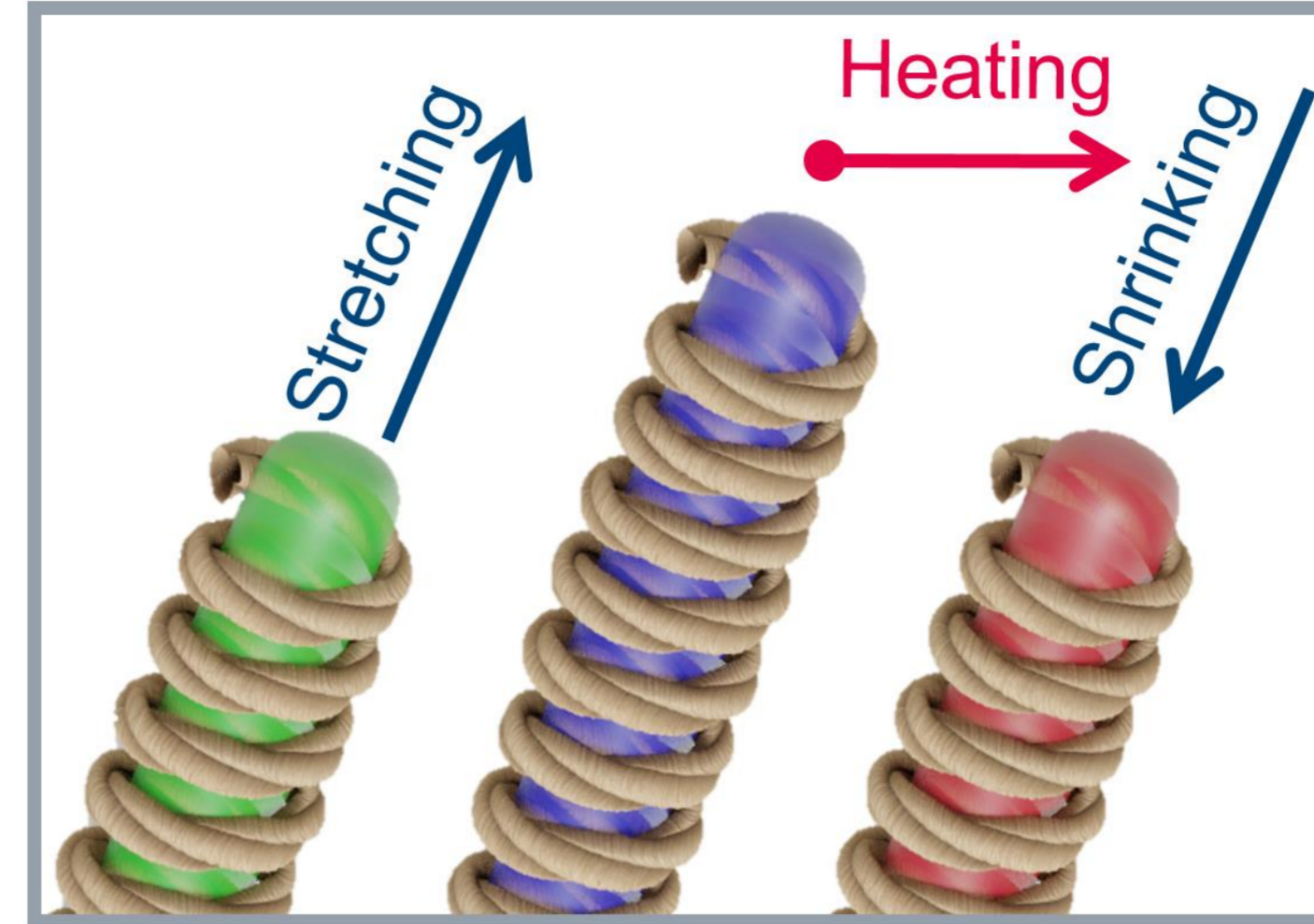


#### Scientific competition

Shape-memory yarns, replacing conventional rubber.  $T_{switch} = 42\text{ }^{\circ}\text{C}$

- Easier donning
- Fit and compression affected by ambient conditions and skin temperature
- Shape-memory yarns sensitive to overstretching and loss of mechanical and shape-memory properties

### Memorthotic solution



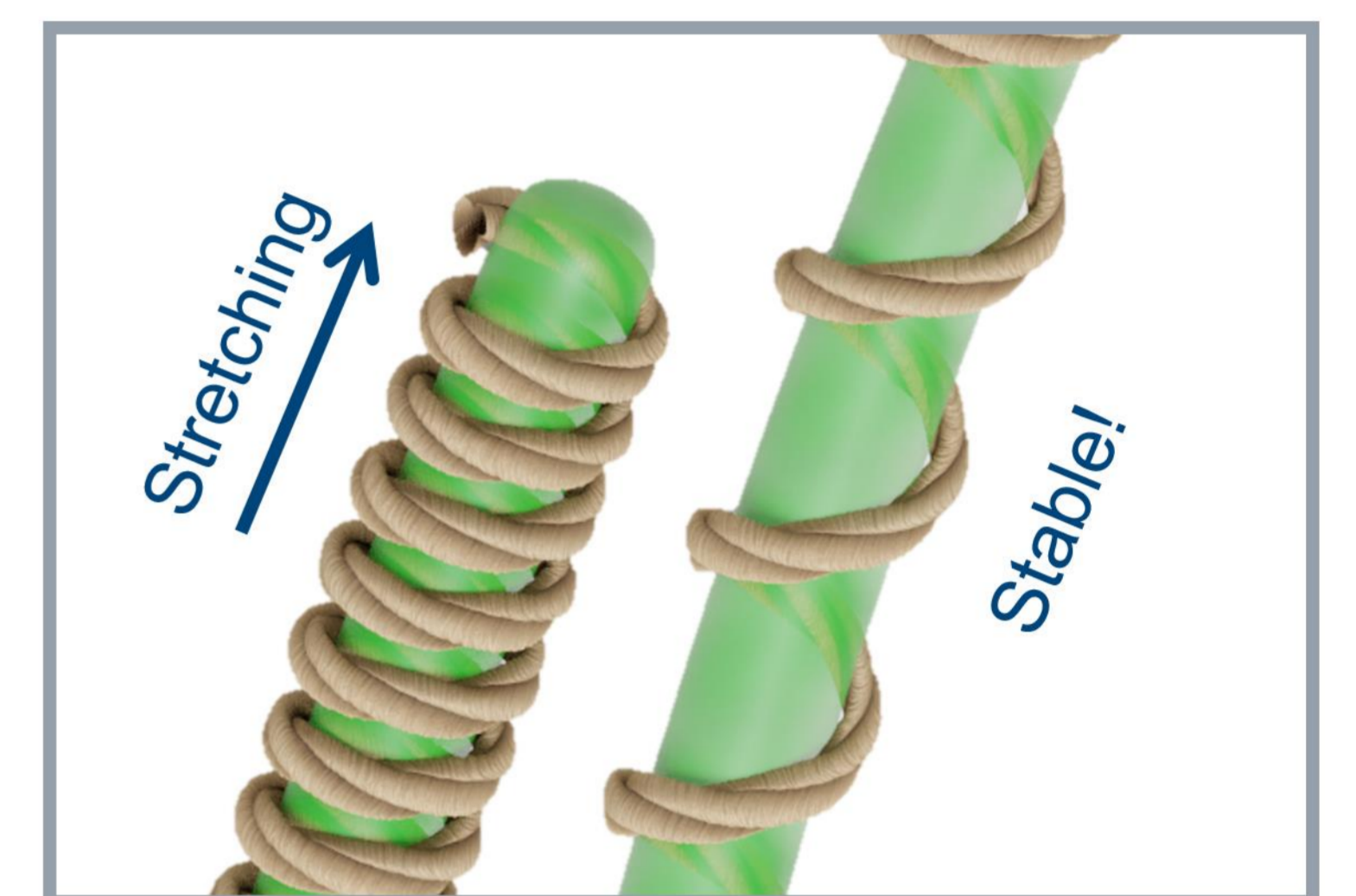
#### Shape-memory core fiber

Repeatable recovery of a memorised shape after deformation in reaction to heating to  $T_{switch} > 50\text{ }^{\circ}\text{C}$ .

Shape and mechanical properties stability in the application temperature range

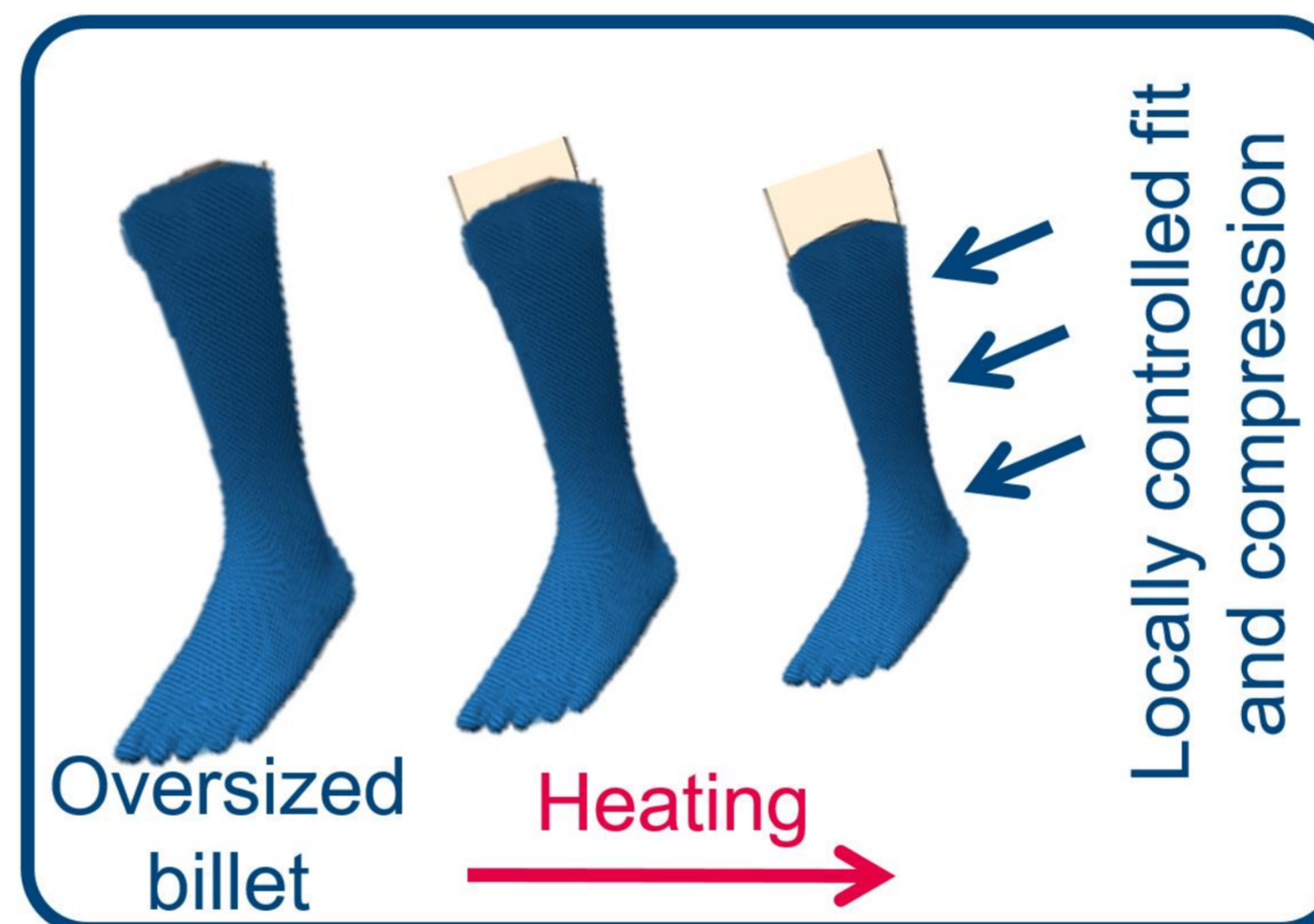
#### Strong covering yarn

Prevents core fiber overextension and loss of fit, compression, and shape-memory properties



Patent pending!

### Memorthotic unique selling proposition

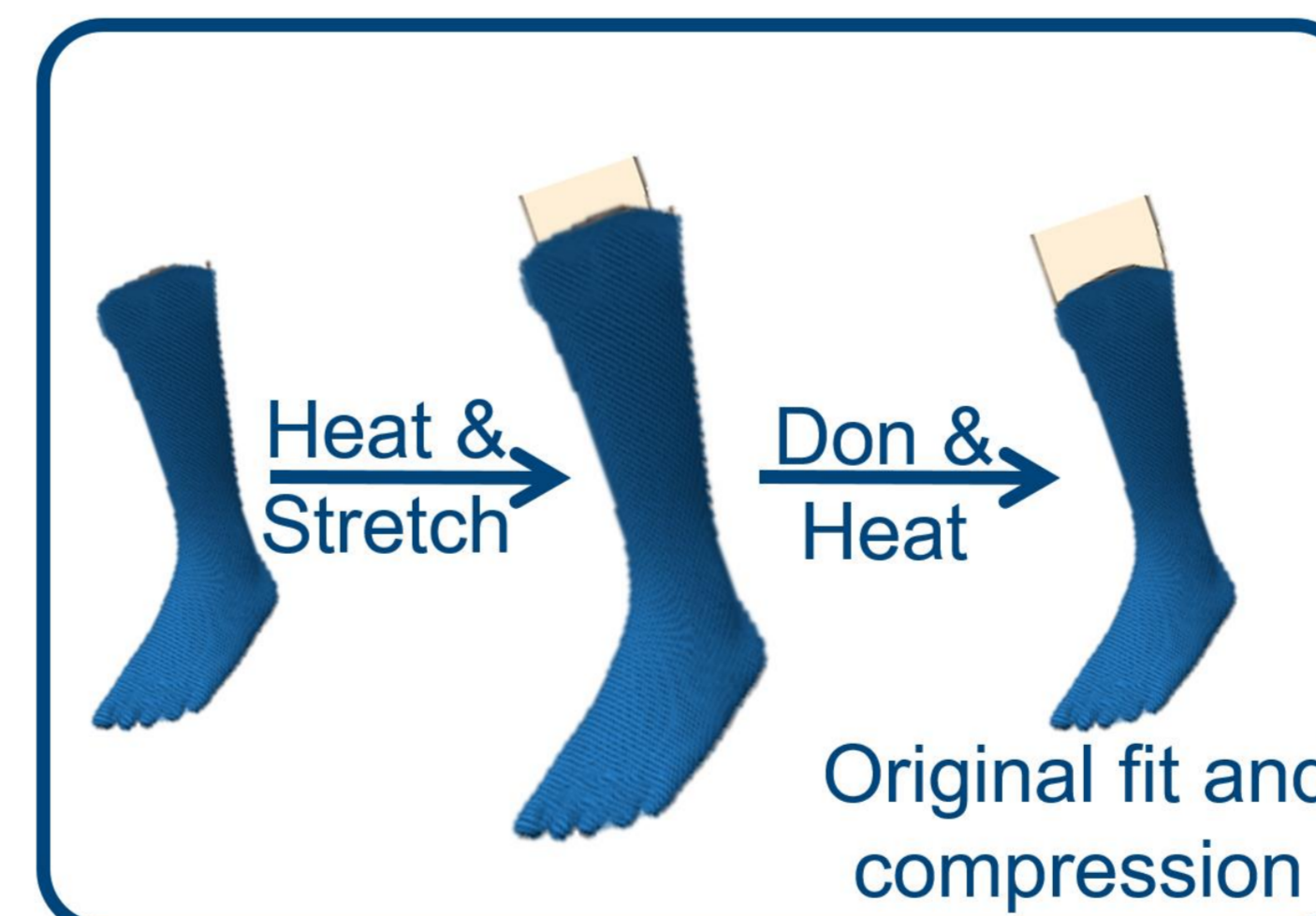
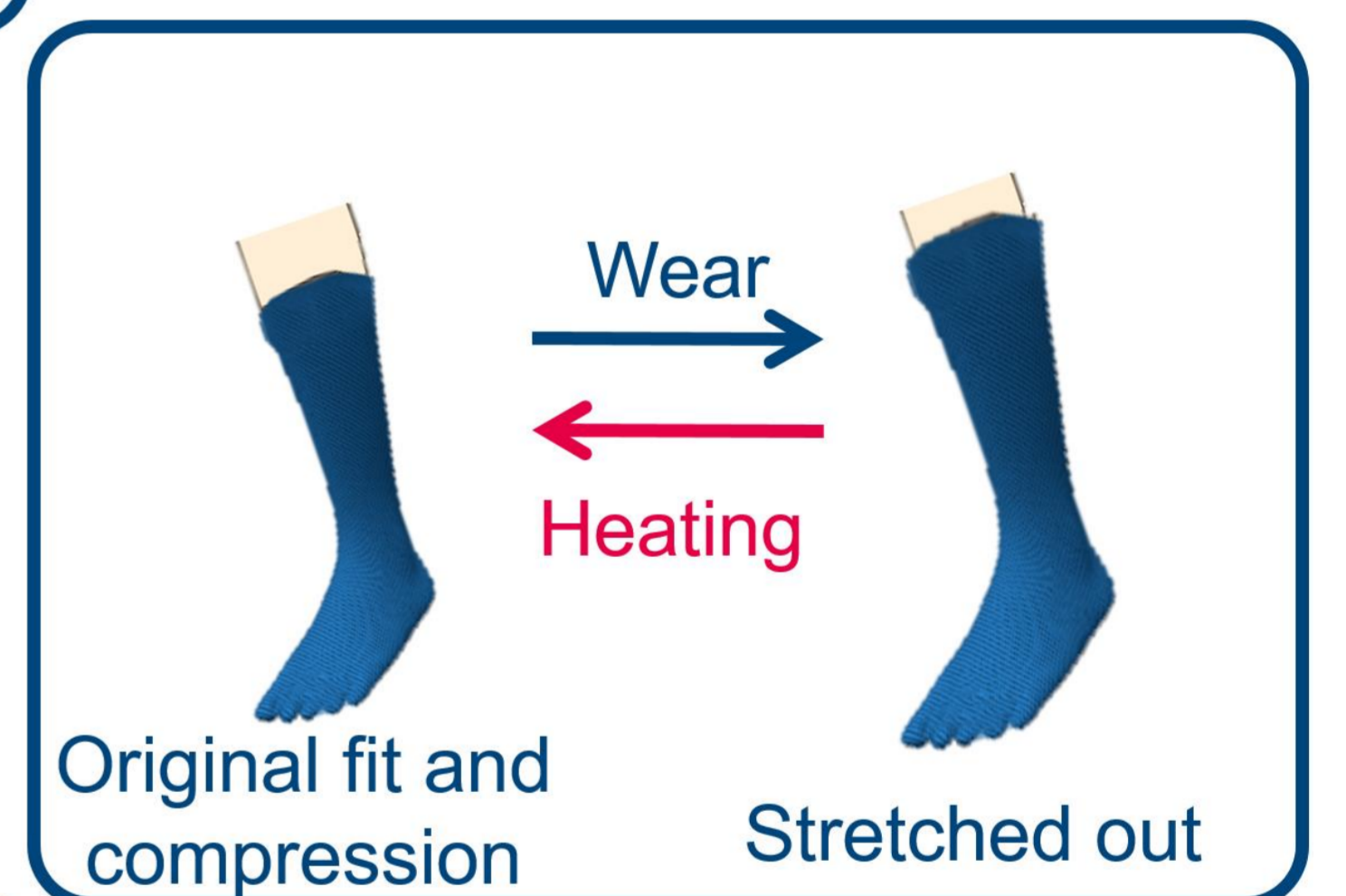


#### Massively manufactured individually fitted

Fitting to patient's anatomy and therapeutic requirements by a trained specialist using controllable heating to  $T_{switch}$ .

#### Wear recovery

Repeatable recovery of lost compression strength and individualised fit through heating with household devices or washing.



#### Simplified donning

Capability to be deformed in a heated state and contracted back to individualised fit and respective compression profile using household heating devices.

#### Financial support

- Transfer campaign from Helmholtz Impuls- und Vernetzungsfonds
- Field Study Fellowship from Helmholtz Enterprise
- Program-oriented funding from Helmholtz Association
- Hereon's Innovation Funds

HELMHOLTZ Information

