

Thermal Comfort of 3D Spacer Fabric for Footwear Insole Application

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Abstract (150 words)

Traditional insole materials which trap heat and moisture inside footwear cause discomfort to the wearer. Here, a novel textile-fabricated insole material with a 3D structure that offers good porosity and breathability for improving the footwear microclimate is proposed. Changes in foot skin temperature and humidity when wearing the textile-fabricated insole throughout treadmill walking are collected from 21 female subjects (age: 25.5 ± 4.5) and compared with traditional and 3D printed insoles. Subjective assessment of their perceived thermal comfort with various insole conditions is also conducted. In comparison to polyurethane, 3D printed thermoplastic polyurethane and leather insoles, textile-fabricated insoles show no significant changes in foot skin temperature. Nevertheless, a significant reduction of the relative humidity of the skin of the sole (3.21%) and heel (24.41%) is found. The findings are a valuable reference for the fabrication of insoles with higher wear comfort.

Highlights (50 words) in point form:

- ✧ Textile-fabricated insole significantly reduces relative humidity of skin of sole and heel during treadmill walking.
- ✧ The four insole materials do not significantly change foot skin temperature after treadmill walking.
- ✧ A trend was observed in thermal comfort perception enhancement with use of textile-fabricated insole.

Keywords (max 3): insole, footwear, thermal comfort