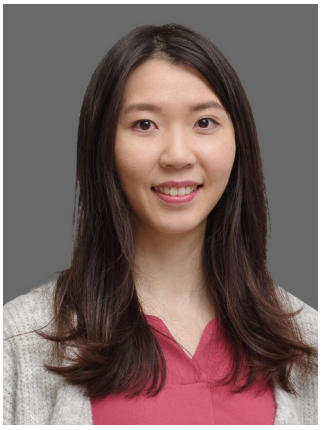
TBIS



Topic of the Speech:
Effect of Structure and Material of Bilayer Knitted Fabric on Tactile Sensation and Warm Retention

Dr. Annie Yu
School of Fashion and Textiles
The Hong Kong Polytechnic University
Hong Kong, China

Dr. Annie Yu is an Assistant Professor in the School of Fashion and Textiles, the Hong Kong Polytechnic University. She obtained her Ph.D. from the same university in 2015.

Her main research interests include the design of novel knitted fabrics and functional textiles. She also specialises in experimental design and evaluation of clothing fit and comfort, physiological and psychological responses of human participants to different types of textiles and clothing products, as well as formulation of simulation models to predict garment-skin pressures.

ABSTRACT SUBMISSION
-FOR INVITED SPEAKER ONLY

TBIS

Effect of Structure and Material of Bilayer Knitted Fabric on Tactile Sensation and Warm Retention

Annie Yu[1*], Jiahui Li [2], Hua Shen[2], Narantogtokh Davaajav[3], Khosbayar Byambajargal[3]
[1]*The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong China*
[2]*Donghua University, Shanghai, 201620, China*
[3]*Mongolian University of Science and Technology, Ulaanbaatar, 14191, Mongolia*
[*]Presenter's email: annieyu@polyu.edu.hk

ABSTRACT (NO MORE THAN 500 WORDS:)

Knitwear plays a crucial role in winter attire due to its heat retention capabilities. The warm keeping function of weft-knitted fabrics are influenced by the yarns and knitting structure employed. Animal fibres are renowned for their excellent heat retention. The fine and elongated fibres of cashmere not only excel in thermal insulation but also offer a soft and pleasant tactile experience, making it a superior choice for sweaters, cardigans, and scarves. other coarser animal fibers such as yak, camel, and wool, while effective in retaining warmth, may not provide the same level of softness to the touch. Synthetic fibres like polyester and acrylic are also widely used in knitwear owing to their cost-effectiveness, ease of care, and durability. However, there are concerns regarding the comfort and breathability of synthetic fibres. The concept of bilayer fabric, which showcases different yarns on each side of the fabric, aims to harness the advantages of each material type. This study is an exploratory investigation into the impact of structural design in creating bilayer fabrics and the effects of material combinations on subjective tactile perception and thermal insulation.

The experiment was divided into two parts. The first part focused on understanding human tactile responses to fabrics made from different animal fibres of the same yarn count, including cashmere, yak, camel, and wool, as well as their combination into a bilayer structure. In the bilayer structure, each side of the fabric displayed only one type of yarn. Twenty participants were invited to conduct a blind tactile assessment, using their fingers and forearms to touch and evaluate the fabric samples, providing subjective ratings on smoothness, softness, irritation, warmth, luxury, comfort, and overall preference. The second part examined the thermal retention properties. Additional bilayer samples incorporating spacer fabric structures and polyester yarn were also tested. The samples were analysed using a hot plate and a forward-looking infrared (FLIR) camera.

The results indicated that people are sensitive to the hand feel of different animal fibers, with the tactile sensation of cashmere being superior to that of yak, camel, and wool. In a bilayer structure with one side made of cashmere and the other side made of another animal fiber, the rating on the cashmere side was significantly affected by the presence of tuck stitches used for linkage. The two different knitted structures for making bilayer fabric showed a slight difference in thermal resistance and thermal conductivity. However, the choice of yarn combination in the bilayer had a more significant effect. Samples with polyester yarn on one side and animal yarn on the other side exhibited higher thermal resistance than samples with only polyester yarn or a combination of animal yarns. Apart from the yarn content, the different structure and linear density of polyester yarn from the animal yarns could influence the overall properties and performance of the bilayer fabrics.

This study highlights the potential of bilayer fabrics and serves as a valuable reference for the utilization and development of such materials in the textile industry.