
Glove's a perfect fit for patients with Raynaud's disease

VCU engineering student Jessica Bishop suffers from a disease that constricts blood flow in fingers and other extremities exposed to cold environments. So she invented a pair of 'magic gloves' that regulate hand temperature in cold environments.



WRITTEN BY
Riley Murtagh

TAGS
magic gloves, raynaud's disease, skin temperature

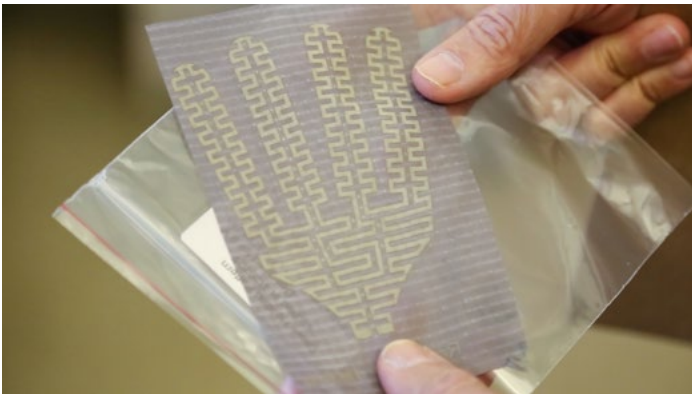
PUBLISHED
Nov. 1, 2016

For her senior capstone design project, VCU engineering student Jessica Bishop wanted to give a helping hand to other people like her.

At age 14, Bishop was diagnosed with Raynaud's disease, which constricts blood flow in fingers and other extremities exposed to cold environments or stress. The extremities' inability to warm can cause discoloration, pain and even nerve damage.

Raynaud's disease affects 5-10 percent of the

‘My hands will turn white over the slightest change in temperature,’ Bishop says. ‘It frustrates you, especially because other people can’t really see what’s happening.’



The gloves have sensors that measure skin temperature and a microchip to modulate the heat. (Photo courtesy of the VCU School of Engineering)



Dr. Mohamed Gadelhak, left, was the faculty adviser for the glove project. The design team included Alisa Sverdlov, Jessica Bishop and Ryan Beaver. (Photo courtesy of Jessica Bishop)

population, but only about 10 percent receive treatment, experts say. The disease has no cure, so for people like Bishop, the only option is to treat the symptoms.

“My hands would get cold and turn purple, but I never really took precautionary efforts,” Bishop said. “It’s gotten to the point where my hands will turn white over the slightest change in temperature. It frustrates you, especially because other people can’t really see what’s happening.”

A regular hiker and cyclist, Bishop became increasingly frustrated with available treatments. This led her to an idea: a pair of “magic gloves” that regulate hand temperature in cold environments. During her senior year, Bishop and three other students built a prototype to display at the 2016 VCU Capstone Design Expo.

While there are heated gloves on the market, none of them regulates the hand’s temperature. This can be an issue, as most gloves tend to overheat and cause the wearer to sweat. To address this, the team programmed its glove to heat only when needed, said Dr. Mohamed Gadelhak, faculty adviser for the project.

“It has sensors that measure skin temperature and a microchip to increase, decrease or shut down heat,” said Gadelhak, professor emeritus in VCU’s Department of Mechanical and Nuclear Engineering. “It saves energy, so the battery lasts longer. That way, the person can go skiing for two or three hours, rather than 30 minutes.”

Nathan Kirby, one of Bishop’s teammates, ran simulations to determine when permanent nerve damage can occur. Using heat transfer analysis, he determined it would take about 16 minutes for the hand to reach dangerous temperatures.

‘We wanted something that keeps you comfortable and able to do everyday activities like walking your dog or even driving with a cold steering wheel,’ Bishop says.

“The modeling that I did brought a good idea of the temperature range we were dealing with,” Kirby said. “It also highlighted the danger of Raynaud’s disease and how quickly you can cause nerve damage to your hand.”

The glove is stitched with a conductive steel thread, making it both flexible and comfortable. The thread allows the wearer to distribute heat to specific parts of the hand. Current market-leading gloves heat only the palm and are too bulky, Bishop said.

“We wanted something that keeps you comfortable and able to do everyday activities like walking your dog or even driving with a cold steering wheel,” she said. “And to make sure it’s affordable and available to everyone.”

The team has a provisional patent for the magic gloves and is seeking a sponsor for a permanent patent. If the students receive a sponsor, the model would progress into manufacturing. •



The students who worked on the project presented it during the 2016 VCU Capstone Design Expo at the Siegel Center. The students were, from left to right, Nathan Kirby, Ryan Beaver, Jessica Bishop and Alisa Sverdlov. (Photo courtesy of Jessica Bishop)