GAME CHANGERS

IN THE LAND OF 10,000 INNOVATIONS, VISIONARIES FROM THE GREATER MSP REGION ARE CHANGING THE WAY SPORTS ARE PLAYED.

Profile: University of Minnesota Wearable Technology Lab

A lot of thought goes into the clothes athletes wear – how it looks, if it's comfortable, the brand. But at the University of Minnesota's Wearable Technology Lab, researchers and students are thinking up a new class of athletic apparel that proactively adapts to benefit athletes and others.

PROFILE
University of Minnesota
Wearable Technology Lab

TYPE
Functional, tech-embedded apparel research and design

STORY THEMES
Wearable technology
Injury and rehabilitation
Sports medicine

OVERVIEW
A new class of athletic clothing is on the horizon: Advanced wearable technology that can work with the human body to aid in sports performance, recovery and rehabilitation. The University of Minnesota's Wearable Technology Lab is in the process of developing innovative clothing that uses cutting edge technology embedded in fabric and sewn into clothing to offer benefits to athletes and others who need it. Two projects of particular interest to the sports world include variable and controllable compression clothing and motion-sensing clothing that can detect body position and offer feedback to an athlete.

KEY PEOPLE
Dr. Lucy Dunne, founder and co-director
Dr. Brad Holschuh, co-director

KEY QUOTE
"Our lab is housed in the apparel design school. You almost never find than in wearable technology programs. I came from an engineering perspective, and engineers tend to approach things from a POV of functionality."
- Dr. Brad Holschuh

OTHER MEDIA
Kare11
sciencefriday.com
(additional application for compression clothing)

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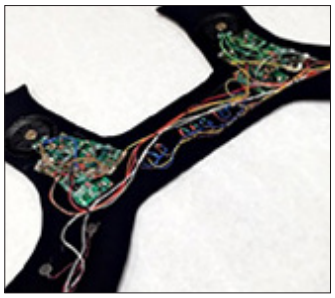
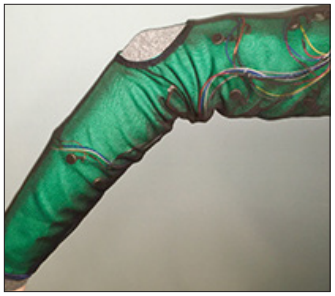


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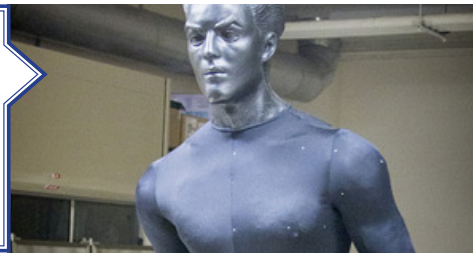

A lot of thought goes into the clothes athletes wear – how it looks, if it's comfortable, the brand. But at the University of Minnesota's Wearable Technology Lab, researchers and students are thinking up a new class of athletic apparel that proactively adapts to benefit athletes and others.

These wearables go far beyond wristbands or clothes with a device sewn on. The cutting edge here features fabrics and pieces with embedded technology that can change how the clothing functions, or can sense and respond to movement or environmental factors.

Some of the key areas for exploration for athletic clothing are rehabilitation and training, where projects at the lab aim to help athletes improve form to help avoid injury and improve performance; recover from strenuous exercise; and offer more precise therapy when recovering from injury.

Dr. Lucy Dunne founded the lab in 2009, which she currently co-directs with Dr. Brad Holschuh.

"[The University of Minnesota] is one of the best places this could have been established, maybe the only good fit for the kind of things I was interested in doing," said Dr. Dunne. "Robust clothing design research is relatively rare. The Minneapolis/Saint Paul region has a lot of industry, we're surrounded by med-tech, and we have a robust start-up culture as well as a really robust clothing-design community."

WEARABLE TECH PEOPLE WILL ACTUALLY WEAR

Wearable technology only works if people will wear it. And that's where the Wearables laboratory distinguishes itself.

"Our lab is housed in the apparel design program. You almost never find than in wearable technology research labs," added Holschuh, whose background is in aerospace engineering, having previously collaborated with NASA. "I came from an engineering perspective, and engineers tend to approach things from a POV of functionality over wearability."

But by blending form and function, and keeping an eye on design – less in a fashion sense and more in a fit and comfort sense – the lab seeks to develop wearable technology real humans will actually wear.

"We want to achieve accuracy and fidelity in a piece of clothing a person can wear all day, every day," said Dunne.

PUTTING A PRECISE SQUEEZE ON BODIES OF ALL SHAPES

This is especially important in clothing for people going through rehabilitation. Compression clothing, Holschuh explained, is prescribed in a variety of cases, from exercise recovery to helping improve circulation in heart disease patients. But in most compression clothing, it is uniformly tight, not accounting for different body shapes – someone with large calves and narrow things will not get equal compression over their entire legs.

Holschuh is involved in a project creating clothing that can offer precise and variable compression exactly where it is needed. With the addition of electronics and actuators, clothing could even be programmed to offer specific levels of compression to specific areas for a set amount of time, allowing much greater precision of therapy.

Currently, the only gear that can do that is bulky, inflatable garments that need to be hooked to a compressor, not a practical option for most people.

Similarly, temperature-sensitive actuators and embedded heating elements might allow a piece of clothing to provide precise heat to targeted areas for prescribed times – either as a wearable heating pad, or the coziest sweater ever.

"There are dozens of treatments that use heat or compression, but the science is poorly understood," Dunne said. "It's certainly not at the level of fidelity that can be accurately prescribed." With wearables, the hope is that researchers can understand if there is a specific temperature that is most beneficial, or if specific pressure/time ratios are more helpful than others.

MOTION-SENSING CLOTHING FOR SAFETY AND PERFORMANCE

Another project focuses on building sensing technologies into fabric. In one application, sensors in a pair of leggings can detect if an athlete is using proper form in a leg motion, especially if a joint like a knee is bending side to side, which can lead to injury or damage. Depending on how it is used, it may collect data for analysis later, or may provide instant feedback to the wearer in some fashion.

"Through interaction, we can create a physical response," said Dunne. For example, the leggings might use vibration to let a person know their form is off so that they can correct or stop what they are doing before they sustain an injury. Dunne stressed the project is still in developmental trials and may function in a different manner, but the potential is exciting.

Producing the technology in a fashion that exists outside the lab is the final, key step. The lab is working with textile manufacturers and garment makers to see if the fabric can be mass produced, and how the garments would be assembled.

Exploring another possible way to make this clothing, Holschuh is working with Minnesota-based 3D-printing leader Stratasys to see if advanced, tech-embedded fabric can be created with 3D-printing technology.

These projects are early stages, but Dunne and Holschuh are excited about the potential, noting that things like compression, heat and motion analysis are often subjective today. "In any of these domains, our technology can be applied to improve the state of the art," said Holschuh.

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