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Technology

Wearable Devices Take Ergonomics to a New High-Tech Place

The technology—which uses sensors to let warehouse workers know when their posture is off—could reduce injuries from repetitive tasks

By Jennifer Smith

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A worker preparing orders for shipment at a warehouse wears a **StrongArm** motion sensor.

Photographer: Michelle Gustafson/Bloomberg

The future of industrial ergonomics isn't a person with a clipboard checking workers' posture.

Warehouse operators and manufacturers are now testing wearable technology intended to stave off injuries from repetitive tasks like lifting boxes that can exact a significant toll on workers' bodies over time.

Companies including [Walmart Inc.](#) [WMT -1.18%](#) and [Toyota Motor Corp.](#) [TM -1.99%](#) are experimenting with sensors that identify when workers engage in risky movements—say, bending their backs without squatting—and prompt them to change their form in real time. The devices also collect data that employers can use to assess how new equipment, tasks or changes in production volume affect worker safety.

Some firms also are testing light but strong garments called exosuits and more-flexible types of exoskeletons that help unload strain from the lower back or shoulders but are designed to be less cumbersome than versions with rigid metal frames.

Overexertion in lifting or lowering was one of the most common events leading to occupational injuries among laborers and freight and stock employees in 2018, the most recent year for which data were available, according to the Bureau of Labor Statistics. The group had the third-highest rate of days away from work due to nonfatal injury and illness at 264.1 per 10,000 full-time workers, trailing only police and sheriff's patrol officers and nursing assistants.

"We pay workers to use their bodies for lifting, and so there is a cumulative effect," says Ed Napiorkowski, general manager of safety, health and environment for Australian wholesaler [Metcash Ltd.](#), [MHTLY 11.90%](#) which is conducting a six-month pilot of wearable sensors from New York-based startup [StrongArm Technologies Inc.](#)

About 100 workers at Metcash grocery, liquor and hardware distribution facilities outside of Melbourne are wearing **StrongArm's** harness-mounted devices on their chests as they pick out cases of beer or hardware items and drive pallet-laden forklifts around the warehouse.

The sensors vibrate to remind workers to keep their backs straight or not twist too quickly. Companies are using the data to assess riskier tasks in their workflows, and to supplement the vibrational prompts with feedback and on-site training to reinforce proper techniques.

"It's not about productivity or pick rates or any of that," Mr. Napiorkowski says. "It's about reducing the chance of people getting hurt."

Retail giant Walmart is running a pilot of the **StrongArm** device at about eight distribution centers to see if it “will help our supply-chain associates work safer in our buildings,” a spokesman says. At auto maker Toyota, meanwhile, managers used data collected by **StrongArm** sensors during a trial late last year at an Indiana plant to assess individual differences in movement patterns and how the order in which tasks are performed might affect safety.

While makers of wearable devices say the purpose is to help employers reduce injuries, the technology also raises privacy and workplace-surveillance concerns, says Jack Dennerlein, a professor at Northeastern University in Boston who studies ergonomics. Employees might feel like Big Brother is watching them, he says, or fear they will be punished for not using the correct techniques.

“This idea of it being a monitor of how workers are behaving, using a carrot and stick, that’s not going to work,” he says.

Sensor makers say their devices aren’t meant to be used to penalize workers or to track information beyond the ergonomic data.

“The device doesn’t have a GPS, it doesn’t have a camera, it doesn’t have a microphone,” says Haytham Elhawary, co-founder and chief executive of One Million Metrics Corp., a New York startup that does business as Kinetic and whose pager-like sensors clip on to workers’ belts to measure their body mechanics. “We really insist with managers that it’s not punitive.”

Document-storage company [Iron Mountain Inc.](#) [IRM -2.67%](#) began using Kinetic’s devices three years ago to reduce at-risk postures that contribute to sprains and strains among warehouse staff and drivers who collect paper for shredding or storage. The technology takes the motion of the wearer’s hip and uses artificial intelligence and algorithms to reconstruct what that person’s body must have done to make it move that way, then determines whether the motion is high risk.

Direct observation isn’t as precise because it can cause people to alter their movements, Mr. Elhawary says. Many ergonomics professionals “still use tape measures,” he says, “so bringing data to that is helpful.”

Donald Keim, Iron Mountain’s director of safety and health programs and compliance in North America, says on average the company has experienced a 45% reduction in at-risk postures that could lead to injuries across 18 markets in North America over three years. He says the company is expanding the program to more than 60 locations this year.

Toyota also is experimenting with [lightweight exoskeletons](#) to reduce upper-body strain among workers performing repetitive overhead tasks that can lead to shoulder injuries.

Companies such as U.S. Bionics Inc., which does business as SuitX, are rolling out increasingly flexible exoskeletons, including models that can be worn under work jackets. Others are taking the concept further with strong but flexible textile-based systems called exosuits that feel more like clothing. The systems are intended to allow a broader range of activities than older industrial exoskeletons that incorporate rigid frames and battery power or use systems of springs and pulleys to augment strength and ease worker strain.

An exosuit developed by Nashville, Tenn.-based HeroWear LLC uses elastic bands that run across the back and connect to the shoulders and thighs to absorb some pressure from lifting.

"The elastic band stretches as you lean down, which reduces the load...Because the elastic has stored up energy in the band, it makes it easier to pop back," says Karl Zelik, HeroWear's chief scientific officer and an assistant professor of mechanical engineering at Vanderbilt University.

Workers can turn off the spring assistance using a type of manual clutch so the exosuit doesn't hamper them in other tasks. HeroWear says tests using sensors that measure electrical activity when muscles contract show the device reduces peak force in back muscles by about 20% during lifting.

HeroWear has tested the exosuits in pilots with a number of third-party logistics providers and retailers, says CEO Mark Harris. The system is set to go on the market in March.

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