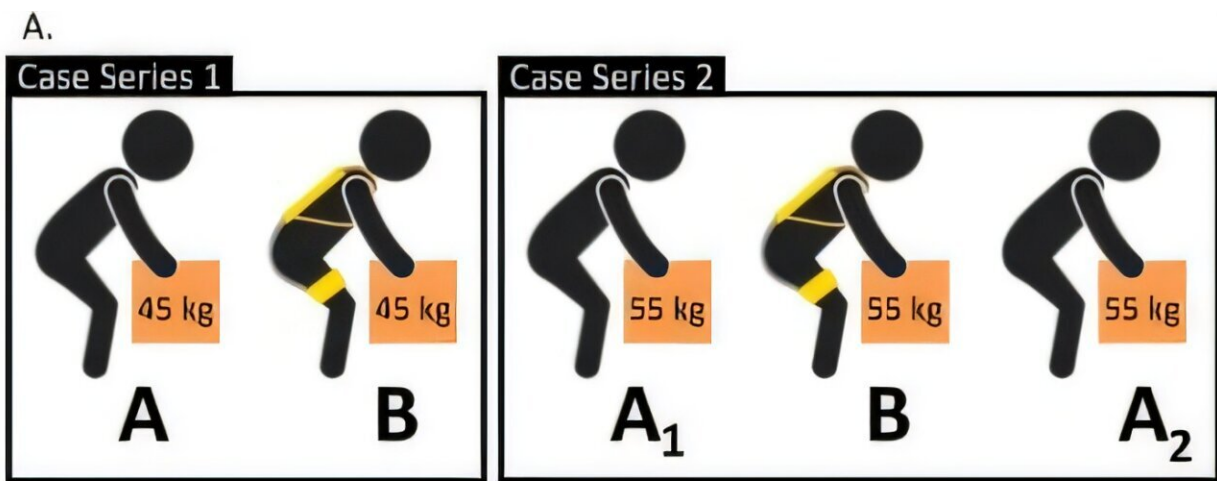


# New research validates performance enhancement and injury risk reduction from back-assist exosuits

December 19 2024, by Lucas Johnson



B.



(A) Overview of lifting endurance tests. In case series 1, participants performed an AB test in which they lifted 45 kg repeatedly until failure without the exosuit and then performed this task while wearing the exosuit. In case series 2, participants performed an ABA test in which they lifted 55 kgs repeatedly until failure without the exosuit, then with the exosuit, and then again without the exosuit. (B) The photos show representative participants wearing the exosuit

during case series 1 (left) and 2 (right), as well as the operationally relevant objects they lifted. Credit: *Wearable Technologies* (2024). DOI: 10.1017/wtc.2024.8

A new peer-reviewed study shows that a back-relieving exosuit originally developed at Vanderbilt University and then commercialized by spin-off company HeroWear can simultaneously increase lifting endurance and reduce injury risk. This has important implications for the future of workplace safety and for workers in civilian and defense sectors.

The results of the study, conducted with U.S. Army Soldiers, were recently [published](#) by the journal *Wearable Technologies*. Vanderbilt biomedical researcher Katherine Rodzak and mechanical engineering Ph.D. student Paul Slaughter co-led the project, along with an interdisciplinary team under the guidance of Karl Zelik, associate professor of mechanical and [biomedical engineering](#) and physical medicine and rehabilitation.

The objective of the study was to test whether a patented new back exosuit could increase a wearer's endurance when lifting heavy objects and to assess whether lifting more cancels out the exosuit's risk reduction benefits. The study found that 88% of participants increased their lifting repetitions while wearing an exosuit, with endurance increases ranging from 28% to 75%. The exosuit tested in the study, called SABER, was developed in close collaboration with U.S. Army Soldiers to support the field artillery and other logistics and sustainment operations in the military.

The study data was then used with an ergonomic assessment model to estimate the effects on cumulative back damage (an indicator of low back disorder risk) when an exosuit is worn and more lifts are

performed. Participants exhibited 27% to 93% lower cumulative back damage when wearing an exosuit.

Studies show that back pain is the leading cause of disability in 160 countries. Furthermore, numerous reports in 2024 from organizations like the U.S. Government Accountability Office, U.S. Senate Committee on Health, Education, Labor, and Pensions, and National Employment Law Project called for more directed efforts to address high and costly workplace injury rates, particularly in logistics and warehousing sectors.

"These results confirmed that wearing an exosuit increased people's lifting ability without canceling out injury risk reduction benefits," said Zelik, who is also co-founder of HeroWear. "This scientific study affirms what we have been observing with workers wearing exosuits in warehouses and distribution centers. There is now converging evidence that these back exosuits can both boost productivity and reduce musculoskeletal disorder risks, which is huge for people who do hard physical work and for the organizations that employ them."

Zelik, who co-founded and co-directs the Center for Rehabilitation Engineering and Assistive Technology at Vanderbilt, started the Nashville-based workforce wearable technology company with two other Vanderbilt alumni, Matthew Yandell and Mark Harris.

Pioneering research and patented exosuit technology at Vanderbilt helped launch this endeavor to reduce back pain worldwide. Now, HeroWear's exosuit is one of the most widely used and scientifically-validated exoskeletons in the world, providing back relief to thousands of workers in over 30 countries around the globe. Last year, HeroWear introduced its newest civilian version of the [exosuit](#), the Apex 2. Earlier this year, the Royal Australian Air Force (RAAF) ordered 470 additional Apex 2 exosuits, following previous purchases and pilot testing in 2023, to give its personnel an extra edge during their service.

**More information:** K.M. Rodzak et al, Can back exosuits simultaneously increase lifting endurance and reduce musculoskeletal disorder risk?, *Wearable Technologies* (2024). [DOI: 10.1017/wtc.2024.8](https://doi.org/10.1017/wtc.2024.8)

Provided by Vanderbilt University

Citation: New research validates performance enhancement and injury risk reduction from back-assist exosuits (2024, December 19) retrieved 20 December 2024 from <https://techxplore.com/news/2024-12-validates-injury-reduction-exosuits.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.