

## Use of Exoskeletons in Beverage and Auto Parts Distribution

### What's the Risk?

Reducing musculoskeletal disorders (MSDs) is a high priority for Amerisure as MSDs are consistently in the top two causes of loss frequency and loss severity for their policyholders. Every year, nearly 280,000 U.S. workers miss work due to MSDs. To address this issue, Amerisure partnered with two policyholder organizations whose employees face risks from manual material handling tasks, such as frequent lifting, carrying, lowering, and moving objects. This collaboration aimed to reduce the risk of MSDs, particularly those affecting the lower back. Evaluating the impact of innovative solutions such as HeroWear with multiple organizations and removing common stumbling blocks can advance Amerisure's goal of reducing lower back injury risks through the use of technology.

### Project Aims

Through participation in the [MSD Solutions Lab Pilot Grant Program](#), this project had the overarching goal of lowering MSDs, specifically lower back MSDs, as well as increasing safety culture in organizations. Workers from the chosen policyholder organizations, Beverage South Distributors, a beer and soda distributor, and Auto-Wares, Inc., an automobile parts distributor, piloted the HeroWear exosuits. Before launching this pilot, Amerisure had established the use of TuMeke in many of its policyholder organizations. While monitoring tasks with TuMeke technology will be addressed, it is important to note that this technology was not the specific focus of the pilot grant project. Instead, the aim was to explore new solutions for preventing MSDs using HeroWear exosuits.

There were several more granular goals outlined for the project:

- Utilize pre- and post-surveys to obtain input from management teams and frontline users regarding the safety technologies' perceived exertion, perceived benefits, and desire to continue use of the products.
  - Administer a perceived exertion and output survey before and after the pilot to compare results.
  - Administer an employee survey to gather information on identified problems, comfort, adoption, level of desire to continue usage, perceived impact, and perceived value.
  - Administer a management survey to gather information on identified problems, level of desire to continue usage, perceived impact, and perceived value, and to follow up on the TuMeke results.
- Compare pre-pilot and pilot data shared by the partner organizations regarding absenteeism rates, employee productivity/production rates, and/or injury rates for pilot group employees, as well as non-pilot group employees (baseline/control group).

## Implementation of Computer Vision Technology

The HeroWear pilot with Auto-Wares ran from December 11, 2023, to March 19, 2024 (100 days), and was conducted at Auto-Wares' Chicago, IL, warehouse. The pilot with Beverage South Distributors ran from December 11, 2023, to March 14, 2024 (95 days), and was conducted at Beverage South's Columbia, SC, location. Each company was provided with HeroWear exosuits for 10 of their order pickers at the chosen warehouse locations.

To better understand the exposure to MSDs faced by employees of Auto-Wares and Beverage South, multiple tasks were evaluated prior to the pilot using TuMeke Ergonomics' software. Thirteen tasks at Auto-Wares' facility and three tasks at Beverage South's facility were evaluated. As displayed in Table 1, 77% of Auto-Wares' task assessments and 67% of Beverage South's task assessments were determined as high risk for MSD injury. An additional 15% of Auto-Wares' tasks scored in the very high-risk range.

**Table 1. Pre-Pilot Rapid Entire Body Assessment (REBA) of Tasks**

Risk Level	Auto-Wares Tasks	Beverage South Tasks
Acceptable Risk	0	0
Low Risk	0	0
Medium Risk	1	1
High Risk	10	2
Very High Risk	2	0

Once the pilot began, additional data were collected in three formats:

- Exosuit users provided feedback via employee perception surveys, which were administered before the pilot began (as a baseline), during the pilot, and at the end of the pilot.
- Qualitative feedback was received from the exosuit users and managers administering the pilot.
- Anonymized performance metrics were received from both companies. These metrics included injuries and productivity for the pilot period as well as similar non-pilot periods for benchmarking comparison. Turnover and absenteeism data were also reviewed.

## Impacts and Lessons Learned

Of the Auto-Wares employees in the HeroWear pilot, 10% refused to wear the exosuit, 30% stopped wearing the exosuit before the midpoint survey, and 60% wore the suit to completion. Of the six employees who wore the exosuit until the end of the pilot, five employees (83.3%) indicated they would be somewhat disappointed if they could no longer wear the exosuit, and one (16.7%) indicated they would not be disappointed if they could no longer wear the exosuit.

It is noteworthy that Beverage South's employees did not participate for the entire pilot period. The frontline manager who was overseeing the employees in the pilot resigned shortly after the pilot's launch. As a result, employees at Beverage South wore the exosuit for about one week, then most employees did not wear it for about 60 days until upper management required its usage for the last three weeks of the pilot. Of the nine employees who wore the exosuit during the last three weeks of the pilot, five (55.6%) indicated they would be somewhat disappointed if they could no longer wear the exosuit, and four (44.4%) indicated they would not be disappointed. Other results from both organizations' pilots are highlighted in the tables below that utilize pre- and post-pilot data to make determinations about changes in employees' perceptions about completing the work tasks and the levels of discomfort.

**Table 2. Employee Experience Wearing Exosuit**

Using the HeroWear Apex 2 exosuit resulted in a:		
	Auto-Wares	Beverage South
Change in the rating of how tired an employee feels after a typical workday	3.5% reduction	8.0% increase
Change in the rating of how tired an employee feels from a typical lift	3.7% reduction	31.4% reduction
Change in the rating of how tired an employee feels from their heaviest lift	40.7% reduction	42.2% reduction

**Table 3. Discomfort After Wearing Exosuit**

Using the HeroWear Apex 2 exosuit resulted in a:		
	Auto-Wares	Beverage South
Change in the rating of shoulder discomfort	22.7% reduction	28.6% increase
Change in the rating of upper back discomfort	No change	18.6% reduction
Change in the rating of lower back discomfort	26.9% reduction	32.8% reduction
Change in the rating of hip discomfort	31.3% reduction	No change
Change in the rating of thigh discomfort	80.0% increase	50.0% increase
Change in the rating of knee discomfort	No change	3.7% reduction

As shown in Tables 2 and 3, Beverage South employees indicated an 8% increase in fatigue at work and a 50% increase in thigh discomfort due to wearing an exosuit. Qualitative feedback from Beverage South employees gave insight into these ratings. Order pickers in the pilot stepped on and off certain equipment to complete their tasks 100+ times per day. Although the exosuit does have a feature to turn off the exosuit's tension/support when stepping up onto equipment, the employees felt it was cumbersome to turn the exosuit on and off 100+ times per day. As a result, the exosuit remained active as employees stepped on and off the equipment, creating tension and placing pressure on the legs. When this motion was performed incidentally, the user did not feel fatigued, but when repeated 100+ times per day, it likely created discomfort and increased fatigue in the legs. Auto-Wares' employees similarly indicated an increase in thigh discomfort, which deserves more attention in future pilots to discern the cause.

As shown in Table 3, both Auto-Wares' and Beverage South's employees indicated the greatest benefit from the HeroWear Apex 2 exosuits was realized when they were performing their heaviest lifts, with Auto-Wares' employees indicating a 40.7% reduction in fatigue from their heaviest lifts and Beverage South's employees indicating a 42.2% reduction in fatigue from their heaviest lifts. Employee comments consistently expressed that they want to continue to use the HeroWear Apex 2 exosuits, particularly when performing heavy lifts. In addition to employee perception surveys, data regarding the productivity of employees was also available through the pilot. Comparing the average piece count of Auto-Wares employees who participated in the pilot during the study period to their average piece count during the same period one year prior, there was a 20.2% increase in productivity. Meanwhile, the increase in the average piece count for the employees who did not participate in the pilot was only 5.5% when comparing the same two timeframes. This contrasts sharply with

the 20.2% increase observed among those who did participate, highlighting the significant impact of the pilot on productivity.

Beverage South employees' productivity was slightly lower during the pilot period than the month before and after the pilot. Comparisons for those participating in the pilot and those not participating could not be made, as data for those not in the pilot were not evaluated. More insights into the productivity impact of wearing an exosuit are needed in future pilots and research.

Overall, the pilot of the HeroWear Apex 2 exosuit showed it can have positive impacts on reducing worker fatigue and improving worker productivity. However, these impacts are not realized in all instances. Organizations will achieve the highest return on investment from their exosuit pilot if they appropriately assign an exosuit to suitable tasks and ensure that the pilot is managed by a trained individual who understands how to properly fit the exosuits.



Amerisure Insurance Company's continuous strength and success are the result of an unwavering commitment to service. Since 1912, Amerisure has worked tirelessly to make America's workplaces safer. Their expertise is providing business insurance solutions to the manufacturing, construction, healthcare, and wholesale & distribution industries.



Beverage South is a leading beverage distribution company dedicated to providing a wide range of alcoholic and non-alcoholic products to retailers, restaurants, and hospitality businesses across the southeastern United States. With a strong focus on customer service, efficiency, and community partnerships, Beverage South represents an extensive portfolio of national and regional brands, ensuring that clients have access to top-quality beverages tailored to their market needs. The company is committed to operational excellence, responsible distribution practices, and fostering long-term relationships with both suppliers and customers.

## **Auto-Wares**

**GROUP OF COMPANIES**

Auto-Wares Group of Companies is a leading automotive aftermarket parts distributor and service provider, serving professional repair shops, dealerships, and do-it-yourself customers across the Midwest. Founded in 1976, Auto-Wares operates a network of warehouse distribution centers, company-owned retail stores, and independent jobbers under well-known banners such as Auto Value and Bumper to Bumper. With a commitment to delivering quality parts, exceptional customer service, and technical expertise, Auto-Wares supports its partners with comprehensive training, cutting-edge technology solutions, and a vast inventory of trusted national and private label brands.



At HeroWear, we design and manufacture exosuits to take the strain off the backs of hardworking men and women around the world. Our exosuits work like an extra set of back muscles, offloading up to 40% of back muscle strain, reducing injury risk, fatigue, and work-related discomfort for users. We have thousands of users at hundreds of customers in more than 30 countries around the world.

**Contact Us:**  
[msdsolutionslab@nsc.org](mailto:msdsolutionslab@nsc.org)

**Learn More:**  
[nsc.org/msd](https://nsc.org/msd)

