

Highlights of [GAO-25-107213](#), a report to the Ranking Member of the Committee on Health, Education, Labor and Pensions, U.S. Senate

December 2024

**Why GAO did this study**

In 2021, musculoskeletal injuries cost employers at least \$17.7 billion. Workers in manufacturing and warehousing experienced these injuries at higher rates than all of private industry. Companies are investigating wearables as one option for injury prevention. Wearables that may help reduce musculoskeletal injuries include exoskeletons, which aim to relieve strain in specific muscle groups, and ergonomic sensors, which analyze posture to identify possible injury risks.

GAO was asked to assess the use of wearables in industrial workplaces and their effect on workers. This report discusses (1) the extent to which select wearable technologies affect worker safety, (2) challenges that exist for deployment of wearable technologies in the workplace, and (3) associated ongoing activities that stakeholders are currently undertaking to help address the challenges.

In conducting this assessment, GAO reviewed relevant literature; interviewed federal officials, academic researchers, wearables manufacturers, private companies with experience deploying wearables, a nonprofit organization, and worker organizations; conducted two visits to sites deploying wearables; and attended a conference on ergonomics.

View [GAO-25-107213](#). For more information, contact Karen L. Howard, PhD, at (202) 512-6888 or [HowardK@gao.gov](mailto:HowardK@gao.gov).

# Wearable Technologies

## Potential Opportunities and Deployment Challenges in Manufacturing and Warehousing

**What GAO found**

Certain wearable technologies (wearables) may provide some benefits to workers experiencing musculoskeletal pain or discomfort, such as back pain, but GAO found limited evidence to support wearables’ ability to reduce injuries. GAO examined the effects on worker safety of two of the most commonly deployed wearable technologies in manufacturing and warehousing: exoskeletons and ergonomic sensors.

**Illustration of automotive manufacturing workers wearing arm-support exoskeletons**



Source: GAO (illustration). | GAO-25-107213

Exoskeletons are designed to reduce muscular fatigue and injuries by providing support to specific muscle groups. Laboratory studies generally show that exoskeletons can reduce muscle strain in a controlled environment. Deployments in the workplace, however, have produced limited public studies demonstrating a reduction in worker injuries, in part due to the short duration of many field studies.

Ergonomic sensors are designed to detect postures or motions that could cause injury. Ergonomic sensor manufacturers have self-reported case studies with improved safety outcomes. GAO, however, found limited evidence that current ergonomic sensors improve worker safety, in part because multiple factors contribute to musculoskeletal injuries and posture measurements alone may not accurately predict risk.

Stakeholders have described several challenges from their past experiences deploying exoskeletons and ergonomic sensors. For example:

- Workers expressed concerns about the practicality of wearables. Workers are more likely to use wearables that are comfortable and convenient for their jobs.
- Warehousing and manufacturing company representatives expressed that they may prefer to deploy other injury hazard controls—such as elimination or substitution—before considering wearables. For example, providing a lift table to eliminate a worker’s need to lift objects may be more effective at preventing injuries than using a back-support exoskeleton.
- Many stakeholder groups voiced concerns about data that some wearables may collect, particularly regarding data ownership, privacy, and security.

The wearables market is evolving quickly. Stakeholders told GAO they need more time to assess how well ongoing efforts address these challenges. GAO identified a set of ongoing activities that stakeholder groups (such as wearables manufacturers and companies interested in deploying wearables) are undertaking. These activities include collecting additional data on accuracy and efficacy of wearables and gathering worker feedback as wearables are deployed. Additionally, national consensus committees are currently developing standards to address these challenges. Stakeholders told GAO that continuing these activities may address current challenges and did not favor other policy actions, such as additional standards and regulations.