



Elevating Workplace Safety

A Guide to Implementing
Wearable Sensor Devices
for Occupational
Risk Management



Introduction

In occupational settings, where employee safety is paramount, wearable devices have emerged as powerful tools that revolutionize risk management practices. With their advanced sensors and real-time monitoring capabilities, wearables enable organizations to proactively identify and mitigate workplace hazards. By continuously monitoring vital signs, motion patterns and environmental conditions, these devices provide early warning signals, facilitate emergency response and support post-incident analysis for preventive measures.



Types of Wearables and their Scope

Wearable devices encompass diverse technologies, from smartwatches and fitness trackers to haptic feedback devices and exoskeletons, offering immense potential in transforming occupational settings and enhancing worker safety, productivity and ergonomics.

Wearable sensors can revolutionize injury prevention in occupational settings by providing real-time feedback and support for workers. Haptic feedback devices, such as vibrating wearables and smartwatches, offer tactile cues to guide workers in maintaining proper ergonomics during manual tasks. These devices can alert users when exerting excessive force, adopting poor posture or encountering potential environmental hazards such as heat stress and fatigue.

Exoskeletons, another wearable device without sensors, provide physical support to workers, reducing strain on the musculoskeletal system and enhancing ergonomics. These wearable exoskeletons can assist in tasks involving overhead work, heavy lifting or repetitive motions, effectively reducing the risk of work-related injuries and fatigue.

The scope of wearable sensors in ergonomics spans a variety of industries, including manufacturing, construction, logistics and healthcare. By leveraging these technologies, organizations can optimize ergonomics, improve worker comfort and safety, and enhance overall productivity and well-being in the workplace.

Considerations for Implementing Wearables in the Workplace

Several considerations must be made for companies to implement and integrate wearables into the workplace successfully:

Safety Culture and Employer Commitment

- A strong, well-established company safety and risk management culture is essential. This culture should be led by a dedicated risk or safety manager responsible for overseeing the wearables program. The program must seamlessly integrate with the existing safety and risk management efforts.
- Efforts should be directed towards implementing risk mitigation solutions recommended by third-party experts, such as the wearables vendor and insurance carrier. These solutions aim to reduce employee exposure to risks and enhance employee safety.



- The data collected by wearable sensors drives behavioral changes that can reduce employee risk factors, such as awkward or high-risk postures. Conducting a comprehensive review of the work tasks performed by employees at high risk of injury is crucial. This review helps identify outliers and common trends associated with higher-risk tasks, enabling targeted interventions.
- It is important to recognize that wearables are just one component of the risk management equation. While sensors collect and quantify data, the effectiveness of risk mitigation largely depends on active intervention and coaching. How the collected data is utilized is of utmost importance in reducing employee risk.

Mature IT Systems

- A solid understanding of the organization's IT systems, including Wi-Fi network configurations, is vital for a successful implementation. Wearable sensors continuously gather data while in use, and in most cases this data is uploaded to the cloud once a connection is established via Wi-Fi or Bluetooth.
- To optimize the setup of wearable sensors, charging ports, and Wi-Fi network connections, consider requesting onsite or virtual technical support from the wearables vendor. This support can assist in addressing any troubleshooting issues that may arise during implementation.
- In larger facilities with multiple Wi-Fi networks, it's crucial to position wearable charging port stations in areas with the strongest Wi-Fi signals. Wearable sensors may need to connect to multiple Wi-Fi networks, particularly if they are stored in one location but used in another, such as transitioning from an office area to a warehouse or production/fabrication space.

Workforce Considerations

- Before implementing a wearables program organization-wide, it is advisable to conduct a pilot program. When selecting employees to participate in the pilot, ensure representation from diverse age groups, genders, tenures, job positions and tasks to encompass the entire employee population. Note that tasks with high turnover rates, often associated with temporary workers, may not be ideal, as these workers might leave the organization during the program.
- Employee buy-in is critical for the program's success. To address potential uncertainties among employees, particularly regarding sensor usage, privacy and program goals, consider organizing a kickoff or introductory meeting. This meeting can answer employee questions and alleviate concerns. Full transparency regarding the program's scope, purpose and data collection process must be maintained.

Haptic Feedback

- The use of haptic feedback in occupational settings presents its own set of challenges. A significant concern is the potential for excessive feedback to disrupt workers' concentration and performance. Striking the right balance between providing useful feedback and preventing sensory overload is imperative.
- Effectively addressing these challenges involves carefully designing and customizing haptic feedback systems. This customization should aim to ensure that haptic feedback enhances worker safety without causing unintended disruptions.

Language Challenges

- Language barriers may hinder the effectiveness of the alert feedback provided by wearables. Employees may need help understanding the feedback messages, rendering them ineffective. Offering translations of key phrases or instructions can help workers comprehend the feedback messages, ensuring they are beneficial and informative.

Case Study

CNA Insurance engaged in a pilot study with the wearable solutions provider [GoX Labs](#) to further explore wearable sensors in the workplace. CNA partnered with an existing apparel manufacturing client to conduct this pilot, which lasted 16 weeks and focused on musculoskeletal injury risk (torso risk), fatigue, and dehydration risk reduction. The pilot group comprised 20 employees, evenly split between males and females. The participants were provided with a specifically configured Samsung watch device to monitor heart rate, temperature and perspiration and the BOOST position sensor to track torso motion. Overall risk scores and exposure-specific risk scores were calculated at the start of the pilot and compared with the scores after the interdiction (i.e., intervention). Intervention strategies included job-specific training on biomechanically sound work techniques, ergonomics work design change recommendations, hydration increase strategies and real-time haptic feedback and coaching.

At the end of the pilot, there was a 5.7% decrease in fatigue risk and an 11% decrease in torso risk. Furthermore, there was a 10% decrease in torso and fatigue risks with interdiction in both the men and women individually (Figures 1 and 2). Additionally, a qualitative survey was administered to all the participating employees to gather feedback about their experience with the solution. Most participants indicated the solution helped them be more aware of their posture and pace of performing work but did not necessarily impact how they performed the work tasks. The participants indicated that alerts on the phone would have been more effective if they were provided in the primary language. The response about the haptic feedback effectiveness was mixed; the main concern was excessive feedback being distracting. This was addressed by raising the threshold for risk tolerance based on a discussion with the participating company.

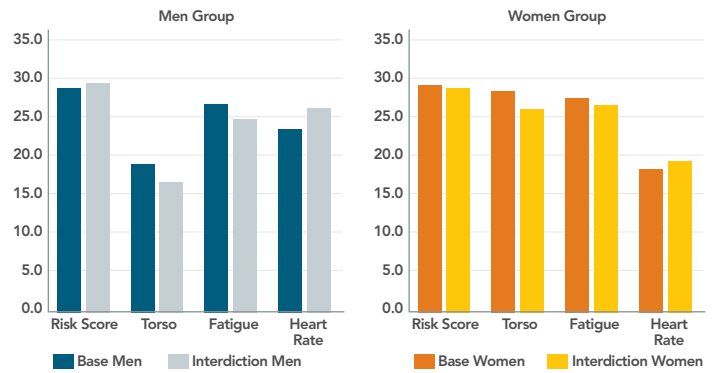


Figure 1

Figure 2

Conclusion

The integration of wearable devices in occupational settings has demonstrated high potential for advancing risk management practices and enhancing workplace safety. By leveraging the real-time monitoring capabilities and advanced sensors of these devices, organizations can proactively identify and mitigate potential hazards, thereby reducing the risk of work-related injuries and improving overall employee well-being. From haptic feedback devices that aid in maintaining proper ergonomics to wearable exoskeletons providing physical support, the scope of wearables' impact spans various industries. The case study involving CNA insurance and GoX Labs underscores the practical application of wearables to enhance workplace safety. However, successful implementation requires careful consideration of factors such as safety culture, IT infrastructure, employee engagement and multi-language options. Ultimately, the commitment to actively interpret and act on the collected data, coupled with strategic risk mitigation strategies and coaching, will determine the success of a wearables program. CNA's Risk Control team, in partnership with our Allied Vendor GoX Labs, offers a valuable resource to assist organizations in effectively implementing and utilizing wearable technology, ensuring a safer and more productive work environment for all.

For further insights and resources, visit the ergonomics page at [cna.com](https://www.cna.com).