

Welcome

THE ROLE OF NEW TECHNOLOGIES IN OCCUPATIONAL SAFETY AND HEALTH

Webinar will begin at 1:00 pm

Presented by:
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THE ROLE OF NEW TECHNOLOGIES IN OCCUPATIONAL SAFETY AND HEALTH

Webinar General Info
PowerPoint Presentation
Q&A

Questions

Chat is open to submit questions.

We will be answering questions through this chat feature. If due to the technical nature of the question a more thorough response is required, we will post the answer on our website within seven days of the webinar.

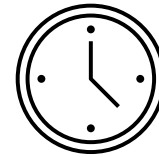


Safety and Health in Numbers



- In 2022, 2,804,000 total recordable cases.
- 5,486 fatal injuries
- 3.7 fatalities per 100,000 FTE workers.

BLS, 2024



A worker died every 96 minutes from a work-related injury in 2022.

BLS, 2024



Work Injury Cost- 2022

- \$167.0 billion
- \$1,040 per worker
- \$1,390,000 per death
- \$40,000 per medically consulted injury

(National Safety Council)



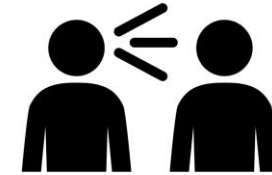
Fatal event or exposure



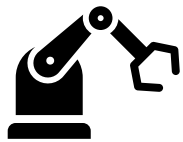
Transportation incidents
2,066 events



Falls, slips, trips
865 events



Intentional injury by person
791 events



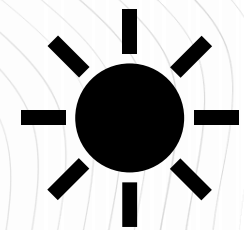
Contact with objects and equipment
738 events



Exposure to other harmful substances
586 events



Fires and explosions
107 events



Heat stress
43 events

Musculoskeletal Disorders



30% of all workplace injuries



Repetitive motion, overexertion, or awkward postures

2022						
MAY						
Mo	Tu	We	Th	Fr	Sa	Su
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

PashaCoffee.com

In 2022, 246,000 cases of MSDs. An average of 12 days away from work.

BLS, 2024



\$15.2 billion annually in direct costs like medical care and lost wages.

(Liberty Mutual Workplace Safety Index)

Fatalities by occupational groups



Farming, fishing, and
forestry
23.5 fatalities per
100,000 FTE



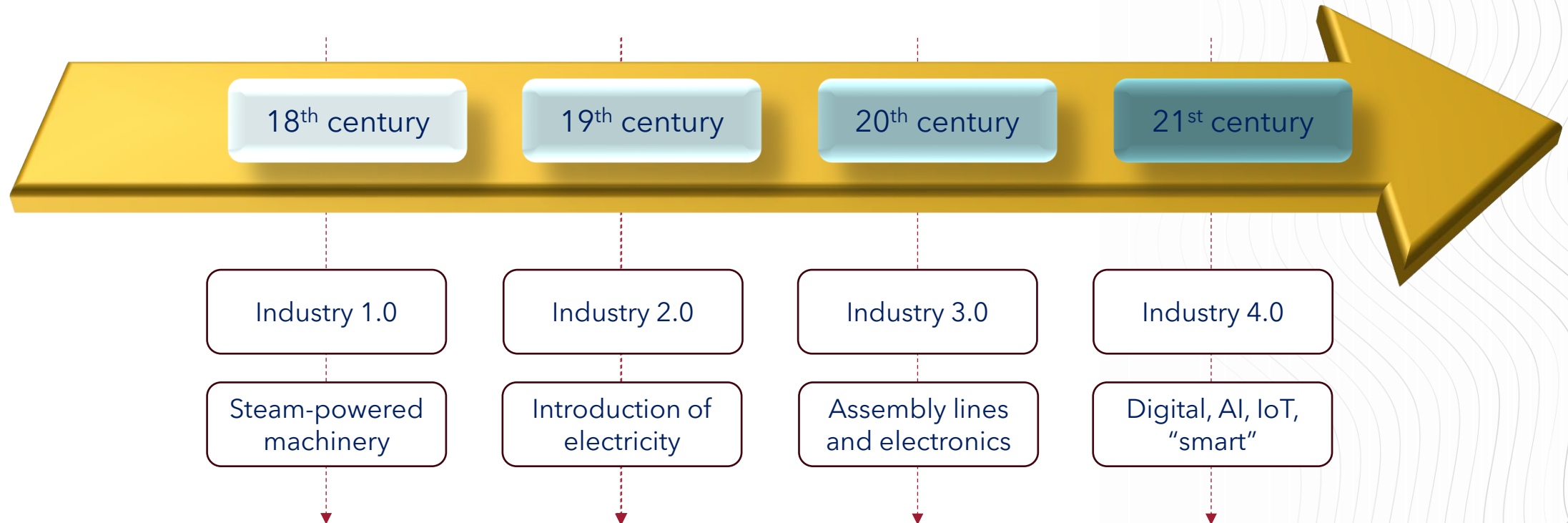
Transportation and
material moving
14.6 fatalities per
100,000 FTE



Construction and
extraction
13.0 fatalities per
100,000 FTE



Industry Revolutions



Emerging Technologies in Safety and Health

Monitoring

- Monitoring and control of vital parameters of workers
- Monitoring of environmental parameters at workplaces

Supporting

- Increasing the physical capabilities of the workers.

Training

- Training of the workers.

Tracking

- Monitoring of location parameters of workers.
- Preventing struck by moving machinery.



Emerging Technologies in Safety and Health



WEARABLE SAFETY TECHNOLOGY

Continuous, objective measurement of posture and movement

COMPUTER VISION AND ARTIFICIAL INTELLIGENCE

Real-time analysis of work postures and environments



EXOSKELETONS AND ASSISTIVE DEVICES

Physical support and augmentation for workers

Immersive training and risk assessment simulations

VIRTUAL AND AUGMENTED REALITY



Wearable safety technology

- A wearable device is essentially a tiny package with powerful sensing, processing, storage, and communications capabilities
- Measure various physiological and kinematic parameters.
- Assess human performance
- Monitor human movement
- Perform motion analysis in a real manufacturing scenario, and/or record user's kinetics, kinematics, physical parameters and/or physiological parameters.

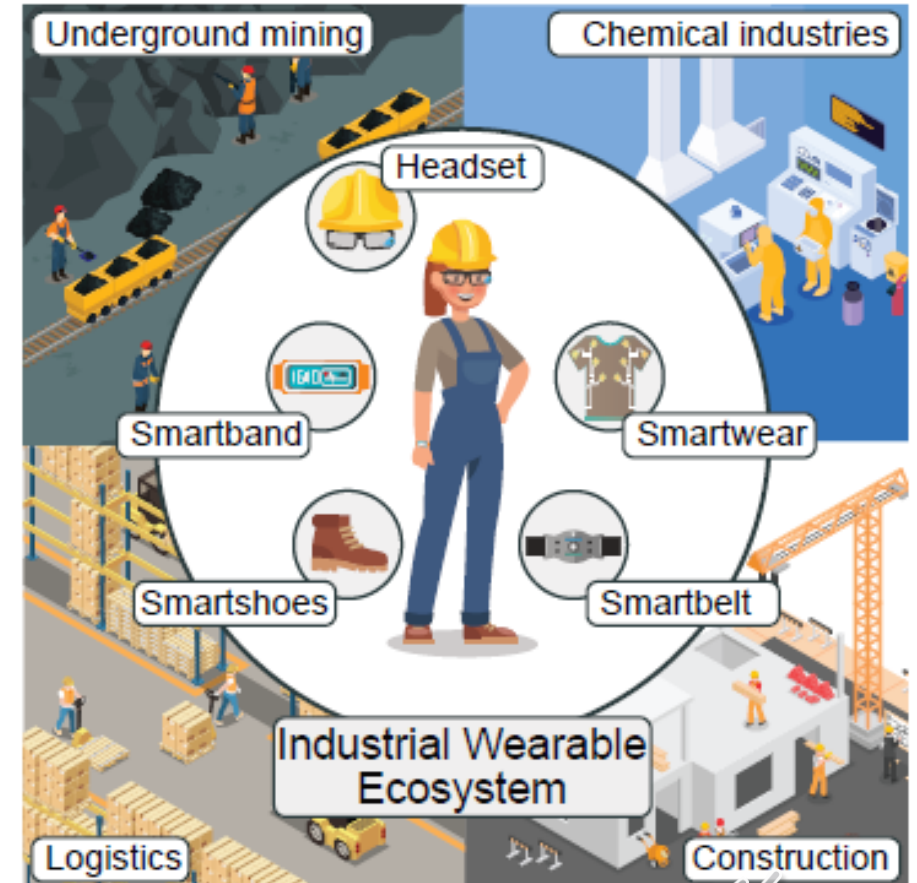


Source: *Emerging Technologies for the Prevention of Musculoskeletal Disorders*. MSD Solutions Lab.

Wearable safety technology

Uses:

- Identify postural movement risks unique to each worker and alert them to change their behavior
- Measure simultaneously joint angles of more than one body part using multiple sensors in real time
- Identify tasks posing MSD risks so they can be assessed and mitigated



Graphic from: *Wearables for Industrial Work Safety: A Survey*, Gvarnka, et al. 2021

Source: *Emerging Technologies for the Prevention of Musculoskeletal Disorders*. MSD Solutions Lab.

Wearable safety technology



WEARABLE DEVICE:
BEING READY TO USE:
PART OF THE BODY:
ERGONOMIC RISK
FACTOR:
TASKS:

Insole Pressure system

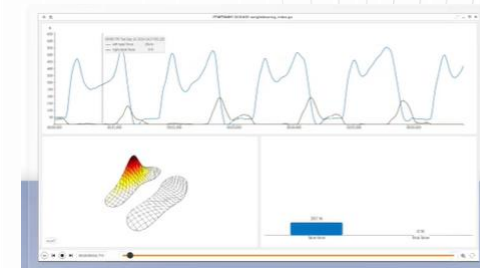
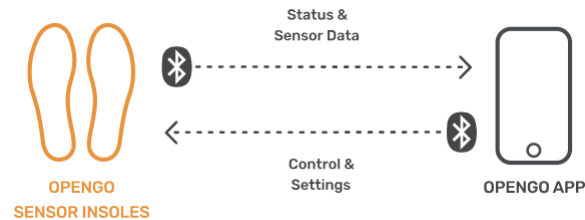
Yes

Foot

Posture

Physical load

Manual material handling,
including holding, carrying, lifting,
lowering, pushing, and pulling.



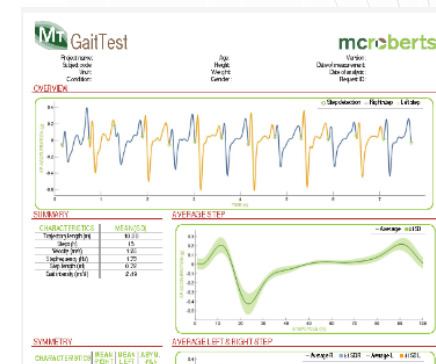
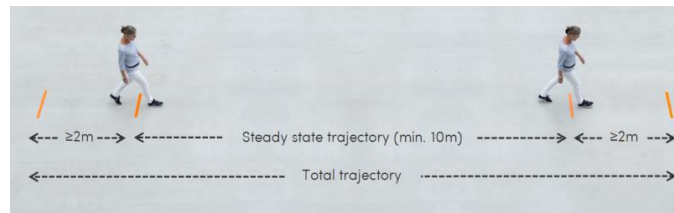
Wearable safety technology



WEARABLE DEVICE:
BEING READY TO USE:
PART OF THE BODY:
ERGONOMIC RISK
FACTOR:
TASKS:

Movement monitor
Yes
Low back

Gait parameters (walking speed, step frequency and step length symmetry)
Manual material handling under different surfaces.



Wearable safety technology



WEARABLE DEVICE:

BEING READY TO USE:

PART OF THE BODY:

RISK FACTOR:

TASKS:

Vibration monitor

Yes

Hand-arm

Vibration

Powered tools



Wearable safety technology



WEARABLE DEVICE:

BEING READY TO USE:

PART OF THE BODY:

RISK FACTOR:

TASKS:

Heat stress

Yes

Ear

Heat stress

Working outdoor

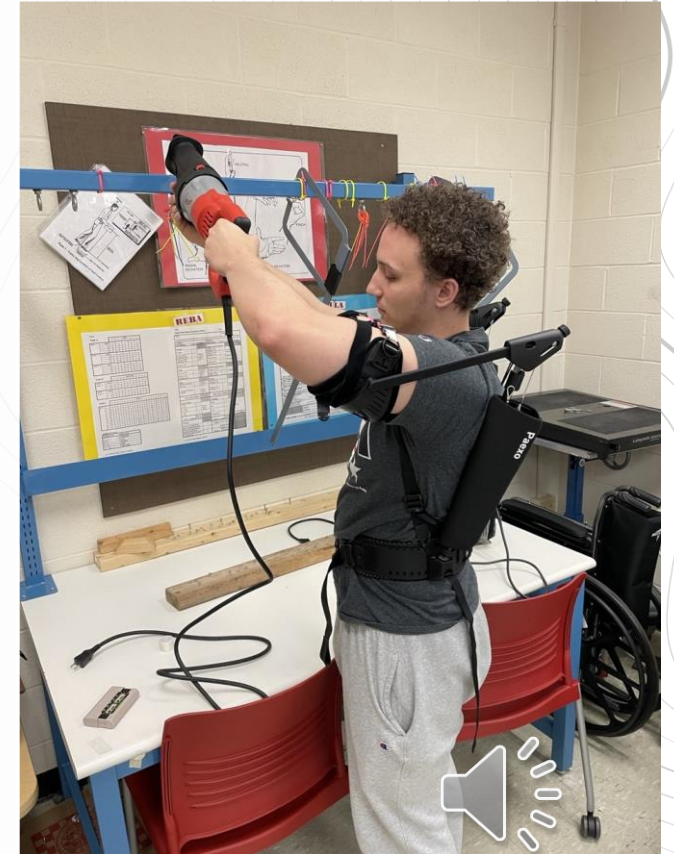


Exoskeletons and assistive devices

An exoskeleton is a wearable device that augments, enables, assists or enhances motion, posture or physical activity (Lowe et al., 2019).

Passive Exoskeletons

- Non-motorized equipment designed to tightly attach above and below the joints requiring protection (Lowe et al., 2019).
- These exoskeletons commonly use a combination of joints and elastic materials to accomplish two objectives.
 - ✓ store the body's energy
 - ✓ maintain the joints in the safest positions
 - ✓ limiting over-stretching and twisting movements.



Exoskeletons and assistive devices

An exoskeleton is a wearable device that augments, enables, assists or enhances motion, posture or physical activity (Lowe et al., 2019).

Powered Exoskeletons

- Mobile machines worn over parts of the body to synchronize with the user's intended movements and trigger powered systems that increase the user's strength or endurance (Lowe et al., 2019).
- They can carry batteries for power, but many require connection to external power sources.
- Powered exoskeletons can support each of the major joints along with their associated muscles.



Exoskeletons and assistive devices

Powered Exoskeletons



Exoskeletons and assistive devices

Powered Exoskeletons



Virtual and augmented reality

- Virtual reality (VR) is a computer-generated digital environment (Jerold, 2016).
- VR headsets project computer-generated images into the wearer's eyes.
- VR provides immersive experiences allowing workers to prepare for hazardous situations in a controlled and safe environment.



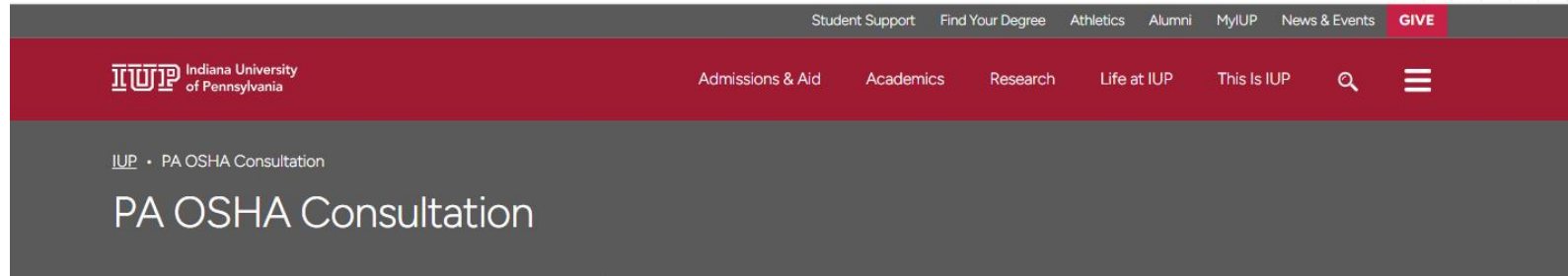
Virtual and augmented reality



Conclusions and Recommendations



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Free Safety Consultations Make Big Impact on Businesses

Employers can receive no-cost safety, health, and industrial hygiene evaluations by signing up for a program run by IUP's Safety Sciences Department.

Through the Pennsylvania Occupational Safety and Health Administration Consultation Program, IUP consultants conduct occupational safety and health evaluations and work with business owners to address issues.



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