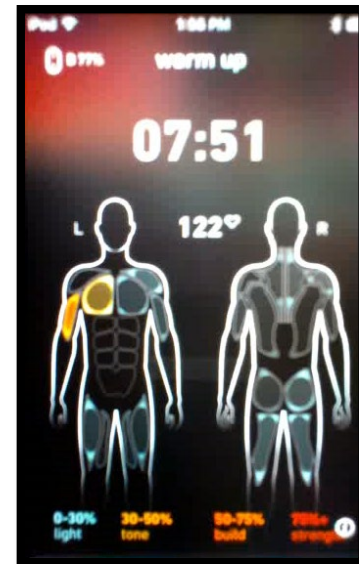
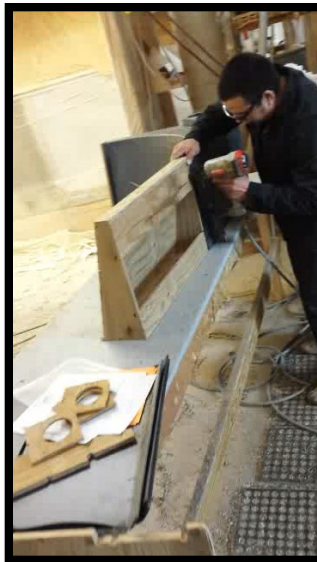




Using Wearable Technology, Leading Risk Indicators and Athletic Trainers to Engage Workers in Injury Prevention and Management

**Presented by: Nicholas Magana M.S. CSCS
Bryan Reich M.Ed. ATC, CEAS**

BioErgo™ = Physiology-Based Ergonomics



- **EMG sensor-based wearable technology assessment of job duty risk for musculoskeletal injuries**
- **Detect & mitigate risk for back strain, shoulder, knee and overuse injuries, etc.**
- **Train workers how to move better to decrease risk of injury**

Wearable Technology for Ergonomic Assessments

Southern California Edison

Comprehensive Program Components



Industrial Sports Medicine

Developing Wellness:

- Performance Exercises
- Early Intervention
- Continuing Education

Addressing Risk Factors:

Hazardous Personal Conditions & Hazardous Personal State



Industrial Ergonomics

Improving Ergonomics:

- Industrial Ergonomics Assessment Process
- Industrial Ergonomics Training
- OU-Specific Efforts

Addressing Risk Factors:

Hazards & Hazardous Activities



Return to Work

Preparing for Return to Work:

- Work Hardening/Conditioning
- Strategic Accommodations

Addressing Risk Factors:

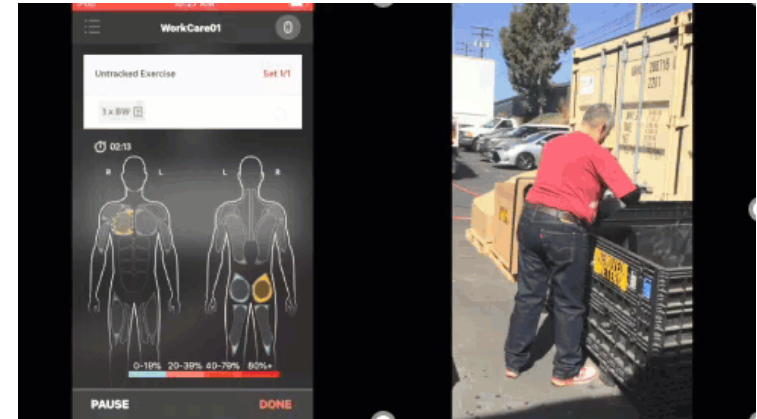
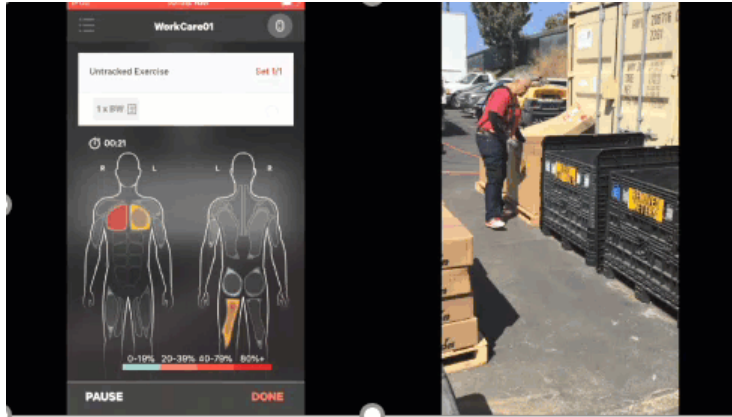
Hazardous System Conditions & Hazardous Personal Condition

- Designed to directly address factors that contribute to sprains & strains
- Comprehensive, data driven, tracked program

Sorting meters

With exoskeleton

Without exoskeleton



Hand/Wrist Risk	1.37
Back Risk	2.98
Shoulder Risk	2.17
Elbow Risk	1.02
FIT Score	1.88

Very Low Risk: 0 – 2.99

Low Risk: 3 – 5.99

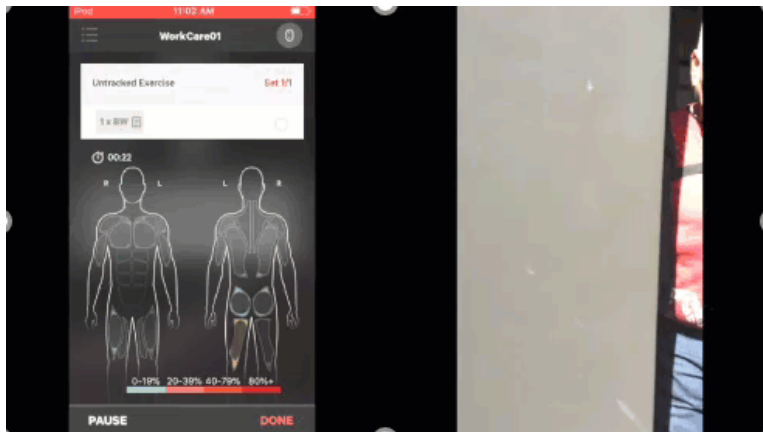
Moderate Risk: 6 – 8.99

High Risk: 9 – 12

Hand/Wrist Risk	1.39
Back Risk	2.91
Shoulder Risk	1.83
Elbow Risk	0.84
FIT Score	1.74

Storing meters

With exoskeleton

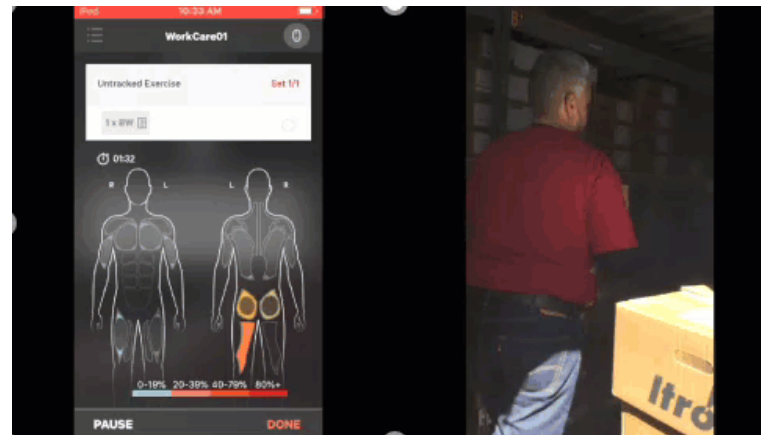


Hand/Wrist Risk	1.72
Back Risk	3.06
Shoulder Risk	1.54
Elbow Risk	0.95
FIT Score	1.82

**Very Low Risk: 0
– 2.99**

Low Risk: 3 – 5.99

Without exoskeleton



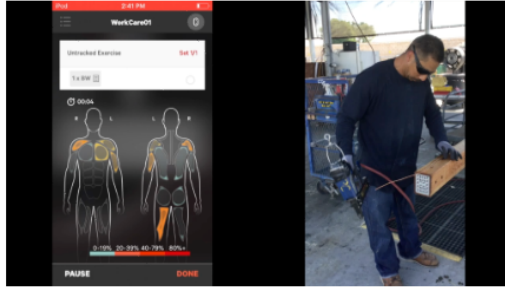
Hand/Wrist Risk	1.78
Back Risk	3.13
Shoulder Risk	1.87
Elbow Risk	1.02
FIT Score	1.95

**Moderate Risk: 6
– 8.99**

High Risk: 9 – 12

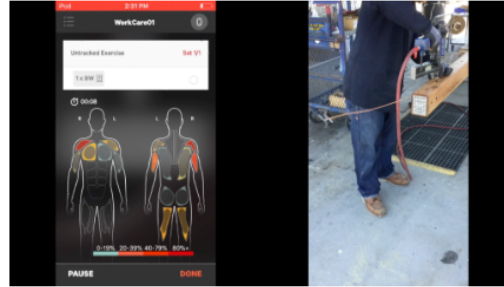
Wood Crossarm Assembly Tools

Staple Gun (held)



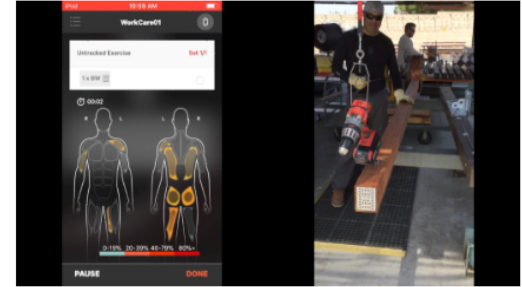
Hand/Wrist Risk	7.70
Back Risk	5.93
Shoulder Risk	6.90
Elbow Risk	6.36
FIT Score	6.72

Staple Gun (hanging)



Hand/Wrist Risk	6.93
Back Risk	4.41
Shoulder Risk	7.06
Elbow Risk	6.17
FIT Score	6.14

Hammer



Hand/Wrist Risk	7.38
Back Risk	5.39
Shoulder Risk	5.64
Elbow Risk	5.45
FIT Score	5.97

Very Low Risk: 0 – 2.99

Low Risk: 3 – 5.99

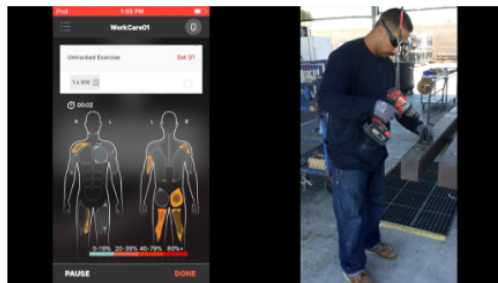
Moderate Risk: 6 – 8.99

High Risk: 9 – 12



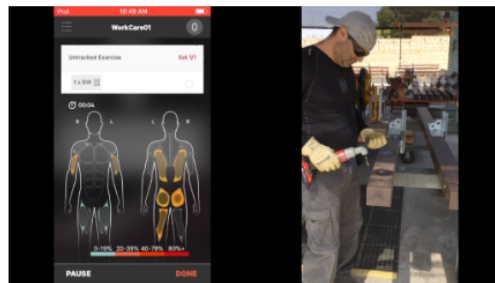
Composite Crossarm Assembly Tools

Nut Driver Drill



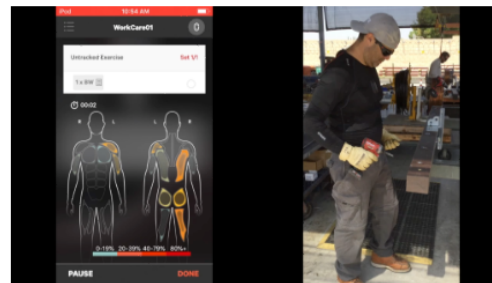
Hand/Wrist Risk	7.99
Back Risk	5.40
Shoulder Risk	4.82
Elbow Risk	5.52
FIT Score	5.93

Angle Nut Driver



Hand/Wrist Risk	6.16
Back Risk	4.92
Shoulder Risk	4.38
Elbow Risk	3.02
FIT Score	4.62

Adjustable Speed Screwdriver



Hand/Wrist Risk	5.32
Back Risk	4.86
Shoulder Risk	4.75
Elbow Risk	3.07
FIT Score	4.50

Very Low Risk: 0 – 2.99

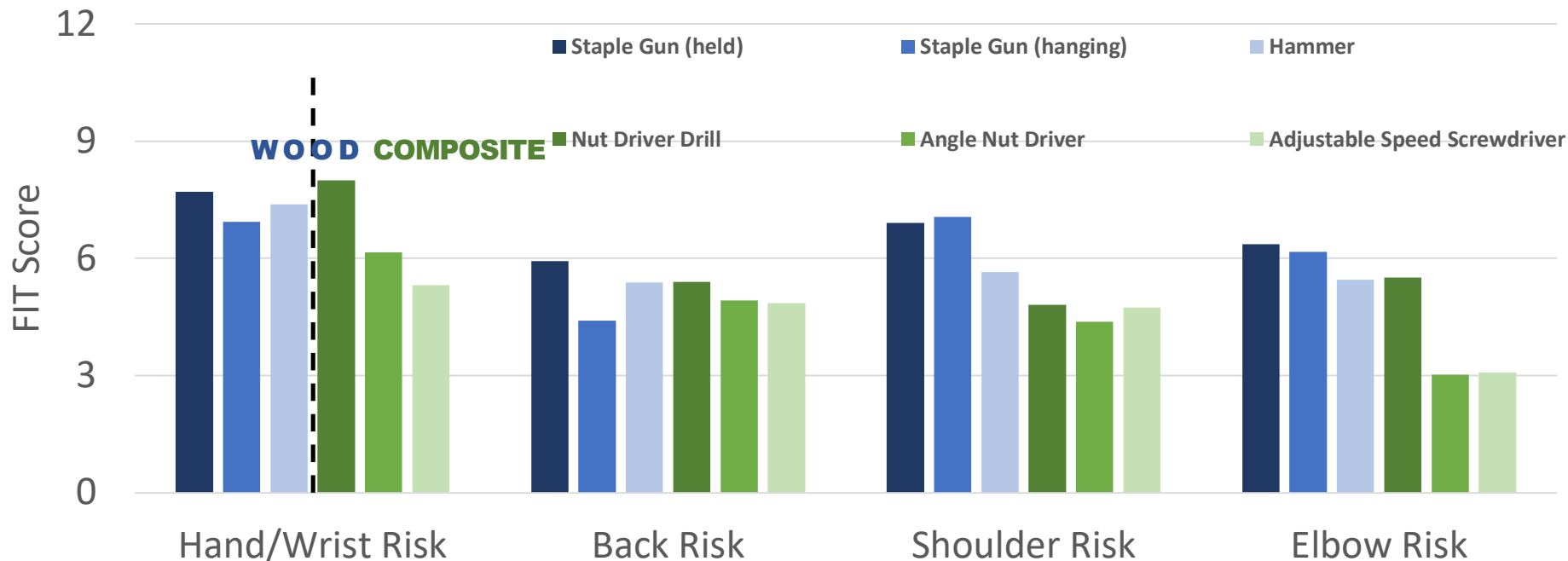
Low Risk: 3 – 5.99

Moderate Risk: 6 – 8.99

High Risk: 9 – 12



Crossarm Assembly Tool Injury Risk



Very Low Risk: 0 – 2.99

Low Risk: 3 – 5.99

Moderate Risk: 6 – 8.99

High Risk: 9 – 12

Comparison by Employee Height

Task	Worker	Hand/Wrist Risk	Back Risk	Shoulder Risk	Elbow Risk	FIT Score
Adjustable Speed Screwdriver	A	5.2573	4.9849	3.8484	2.0990	4.0474
	B	5.3747	4.7274	5.6428	4.0508	4.9489
Angle Nut Driver	A	5.6816	5.1132	2.8727	1.8922	3.8899
	B	6.6327	4.7265	5.8884	4.1505	5.3495
Hammer	A	6.7939	6.2737	4.9392	4.4968	5.6259
	B	7.9645	4.5020	6.3493	6.4117	6.3069
Nut Driver Drill	A	7.1884	5.5937	5.0366	3.9875	5.4515
	B	8.8070	5.2027	4.5967	7.0450	6.4129

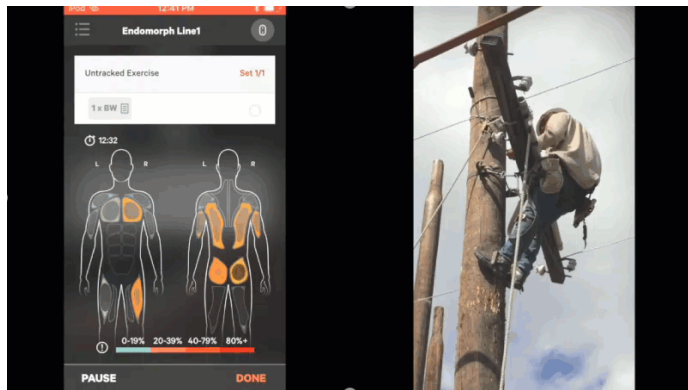


Very Low Risk: 0 – 2.99

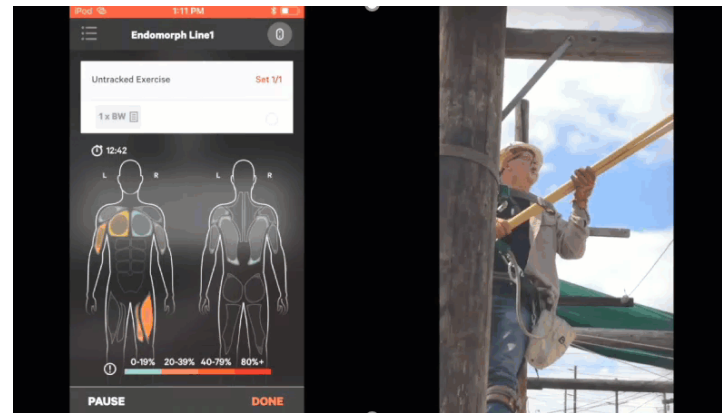
Low Risk: 3 – 5.99

Moderate Risk: 6 – 8.99

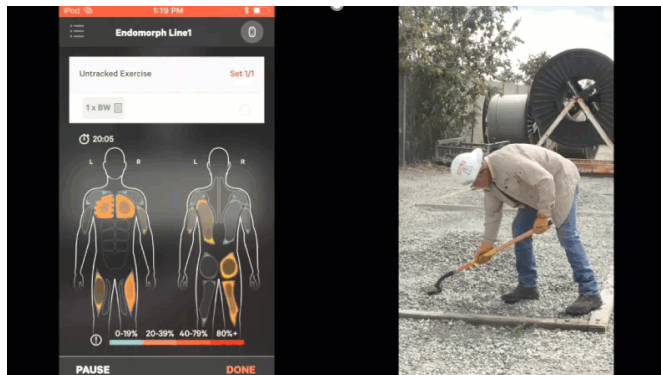
High Risk: 9 – 12



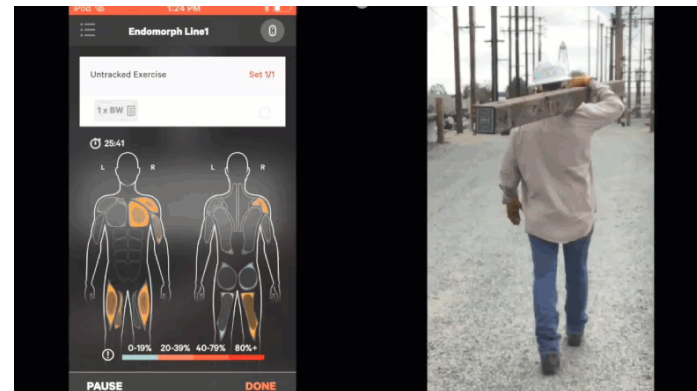
Installing a Crossarm



Replacing Connctor



Various Shoveling Techniques



Various Crossarm Carrying Techniques

Leading Indicators & Athletic Trainers for Injury Prevention



**INDUSTRIAL
ATHLETE**
PROGRAM

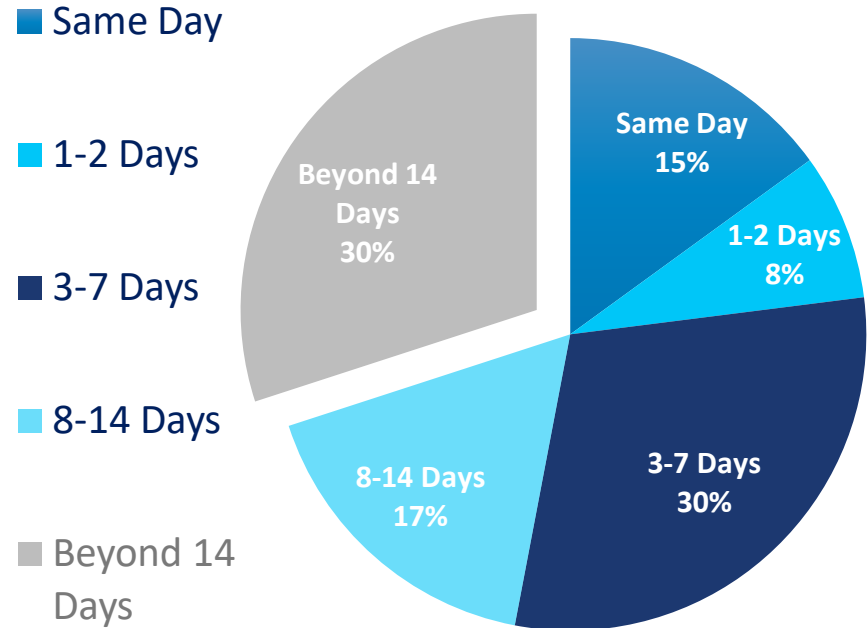
Athletic Trainers & Injury Prevention

- **Why ATCs?**
- **Knowledge**
- **Skills**
- **Abilities**
- **Data Driven**



Industrial Injury Prevention Specialists

- Cumulative representing single and multi-site locations, all shifts, local and distributed workforces
- *70% of musculoskeletal injury cases with IIPS intervention resolve within 14 days*
- 15% of cases resolve on day of first IIPS encounter



Q & A

Thank You



A Wearable Technology Case Study- Identification and Mitigation of Risk in a Distribution Center

**Presented by: Kelson Wann, MS ATC FMS
Briotix Health**

Kelson Wann, MS ATC FMS

Wearable Technology Project Lead- Briotix Health



- Certified Athletic Trainer
- Industrial Sports Medicine Professional
- Master of Science: Kinesiology with an Emphasis on Human Performance
- Certified in Utilization of Functional Movement System
- Exoskeleton and Wearable Technology Project Lead
- Extensive Background in Body Mechanics, Human Performance and Ergonomic Education
- Strategic Use of Services and Technology to Drive Injury Prevention and Ergonomic Services

Wearable Technology Case Study



- **Overview of the Problem and Project Set Up**
- **Project Plan and Implementation**
- **Future Utilization and Other Applications**

International Beverage Distribution Company



Challenges They Saw



Rising Rates and Cost of Injuries

Impacting Production and Performance

Existing Infrastructure was not Sufficient

Dispersed and Varied Workforce

Project Goals



IDENTIFY AREA OF HIGHEST RISK

Individuals, Jobs
and Tasks



IMPROVE EMPLOYEE AWARENESS

Self Tracking and
Monitoring



IMPROVE REPORTING CAPABILITIES

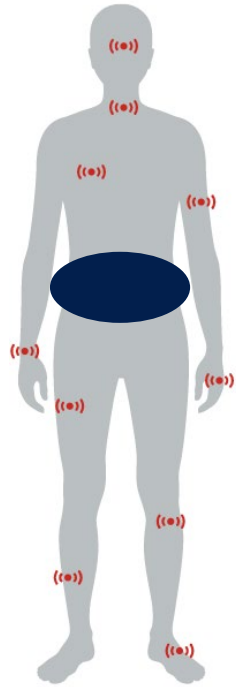
Site-Wide Analysis
of Objective
Movement Trends



PROVIDE DATA DRIVEN INTERVENTION

Individualized and
Targeted Strategies

Innovative Strategy: Wearable Technology



Posture Angle



Repetitions



Speed of Movement



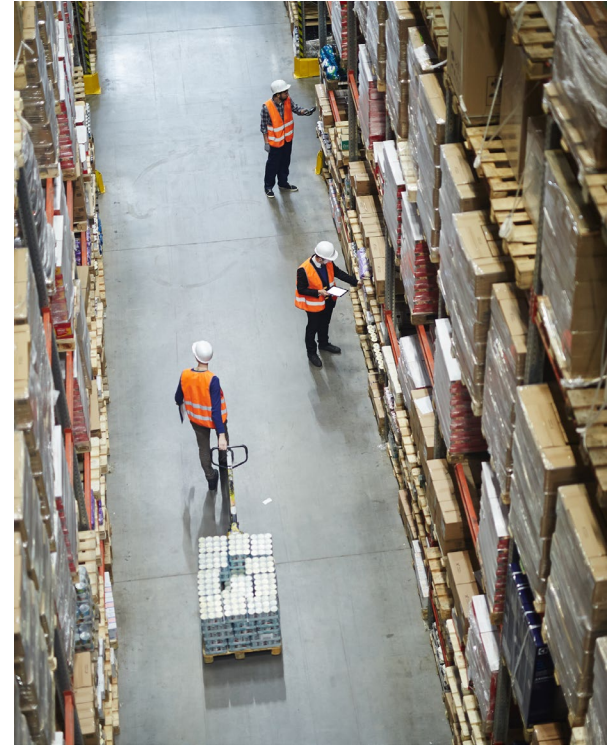
Vibration



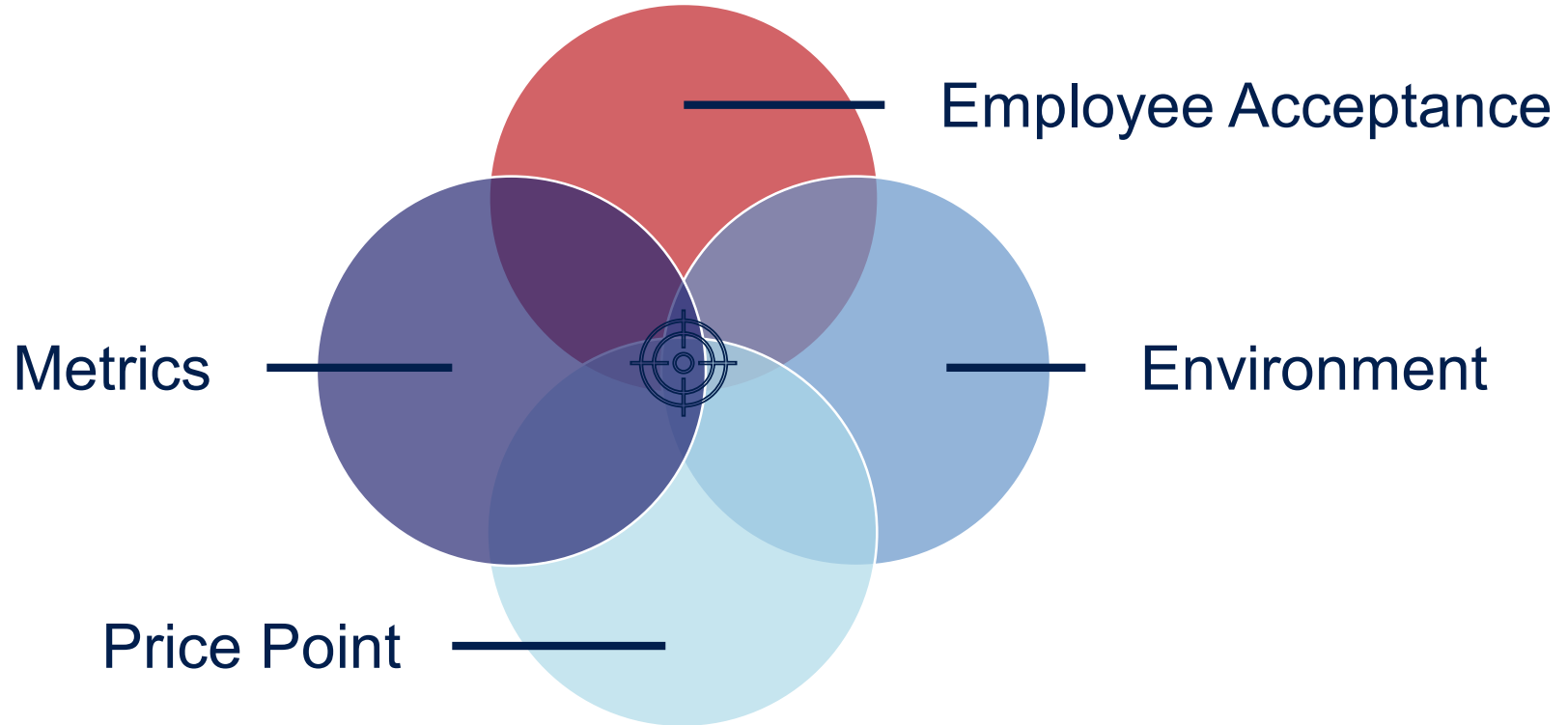
Environmental



Proximity



Device Identification- Finding the Sweet Spot



Pilot Project Plan + Solutions Implemented



Scaling

Long Term Utilization

Data Analysis + Recommendations

Data Informed: Coaching + Haptic Feedback

Baseline Data Collection + Compliance

Training, Education + Recruitment

Pilot Project Launch



Training, Education
+ Recruitment



Baseline Data +
Compliance

Data Collection



Full Length of Shift

Five Days per Week

Six Consecutive Weeks

Informed Interventions

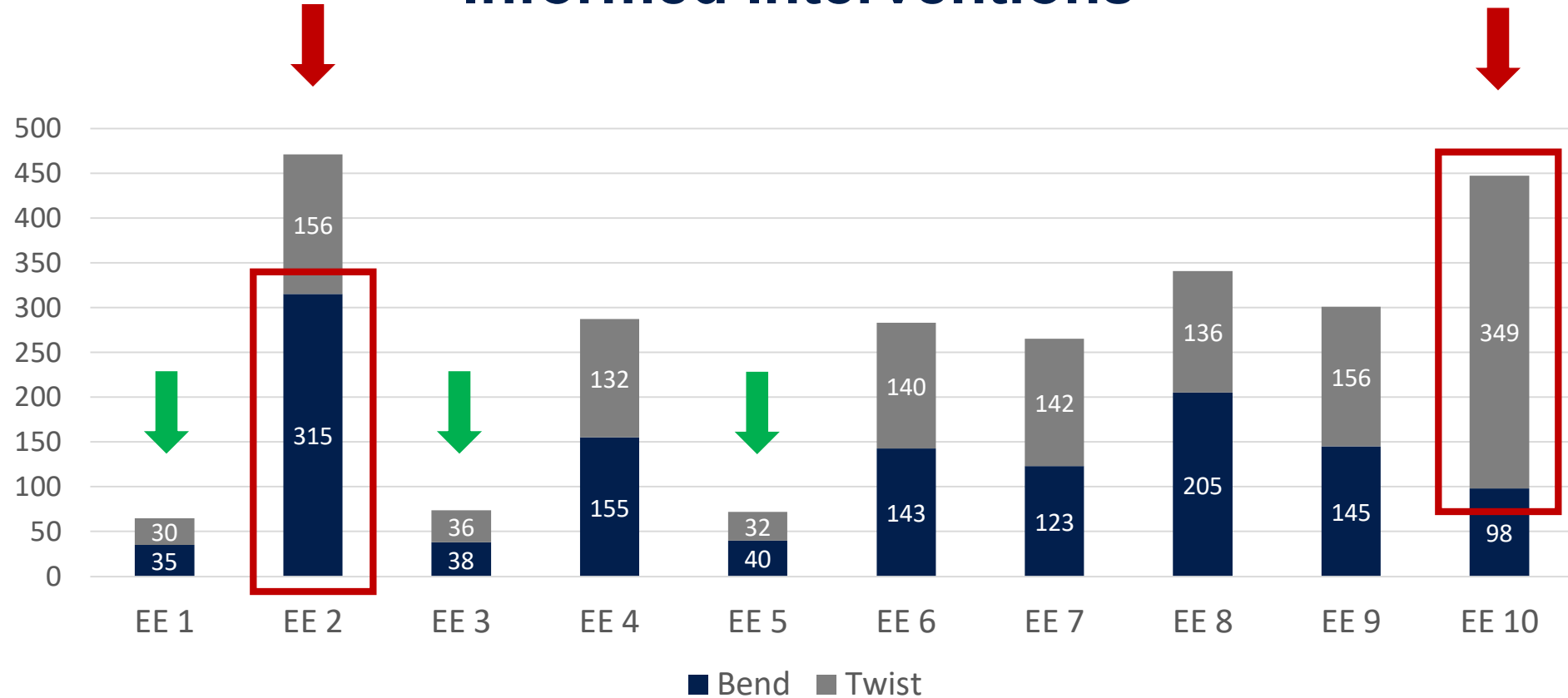


Haptic Feedback

Job Coaching

Employee Reports

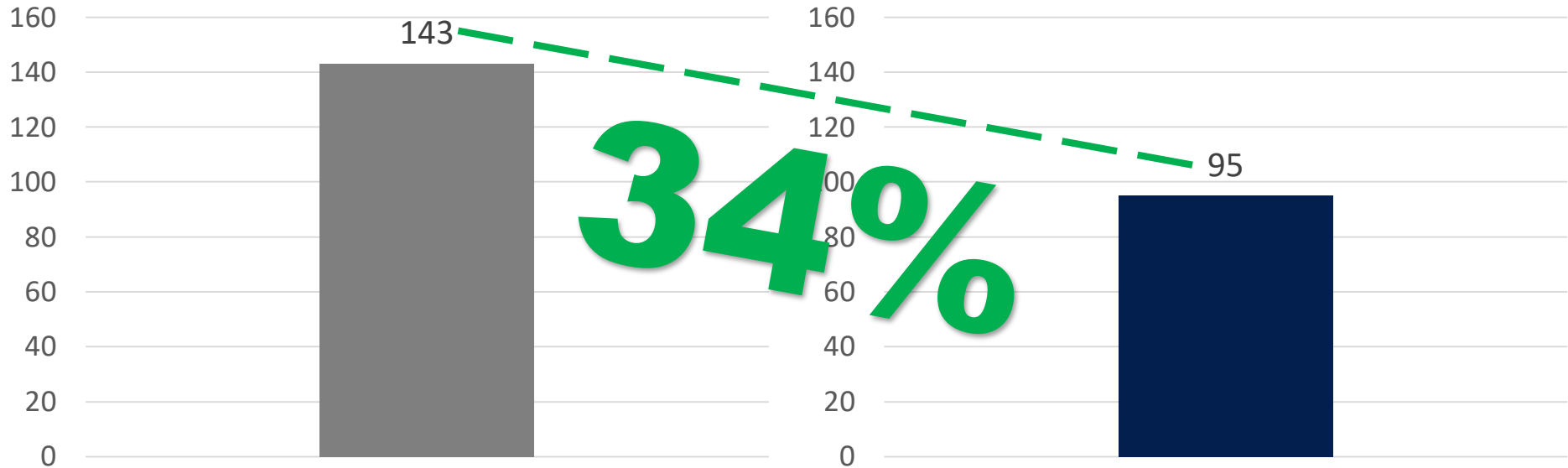
Informed Interventions



Data Analysis and Findings

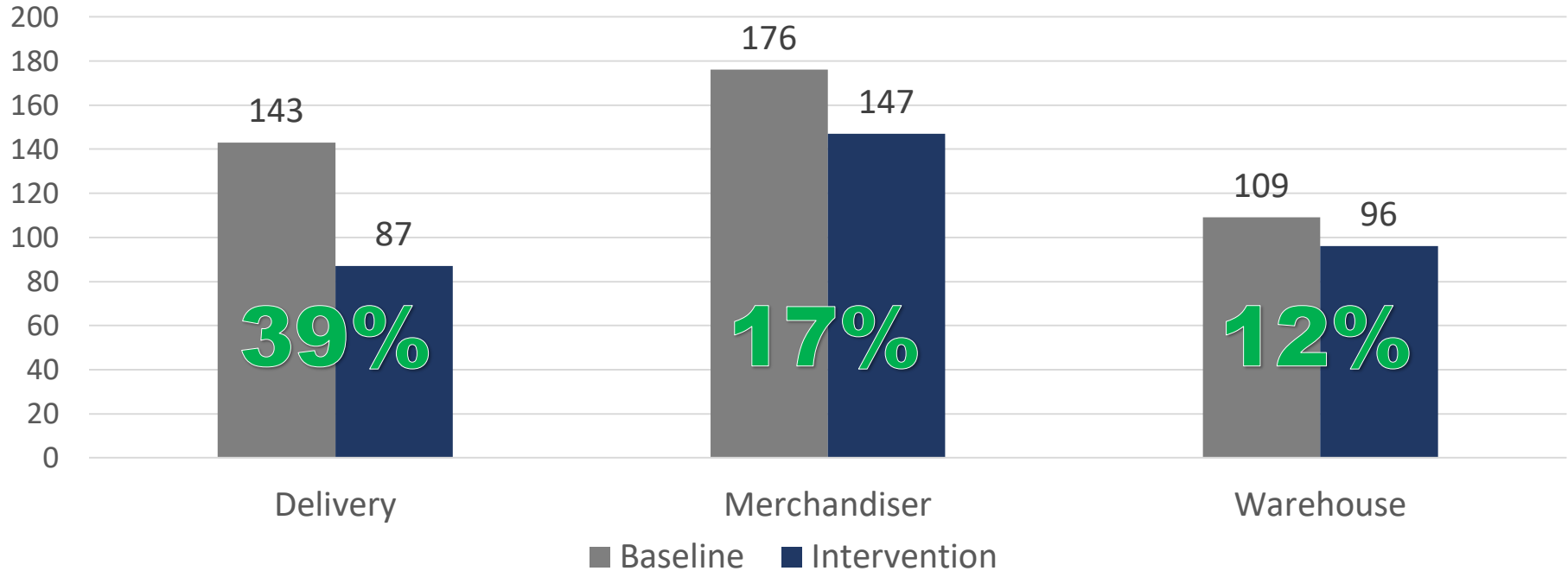
Baseline: Average High-Risk Postures

Intervention: Average High-Risk Postures



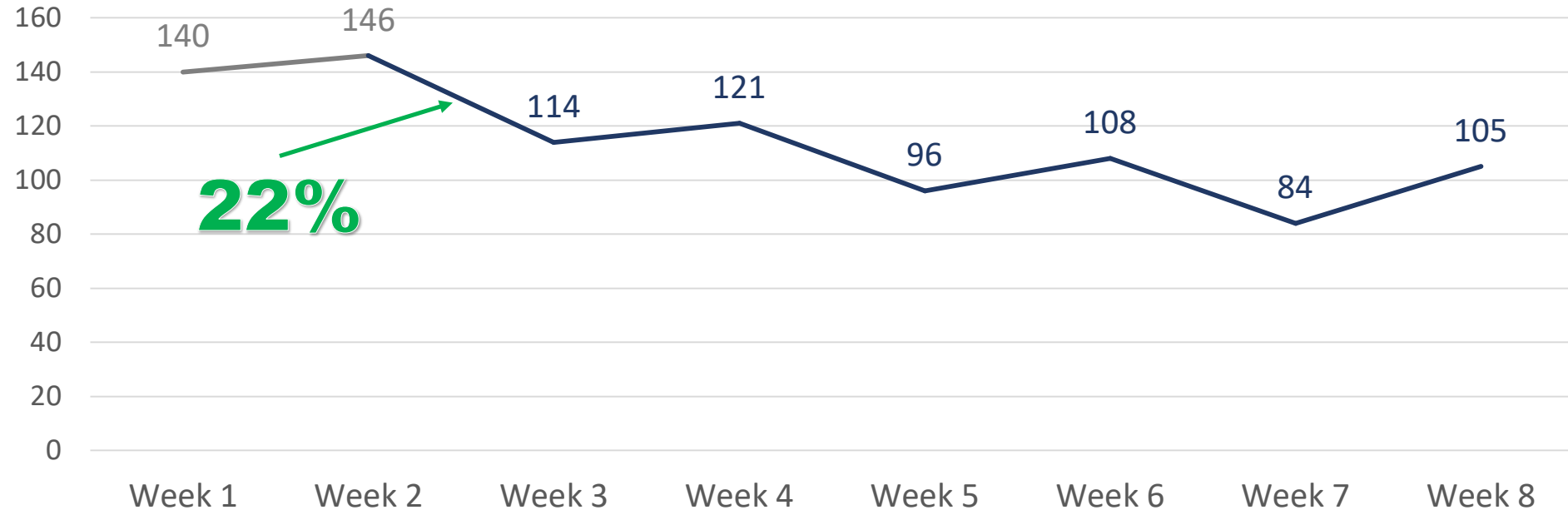
Data Analysis and Findings

High-Risk Postures by Occupation



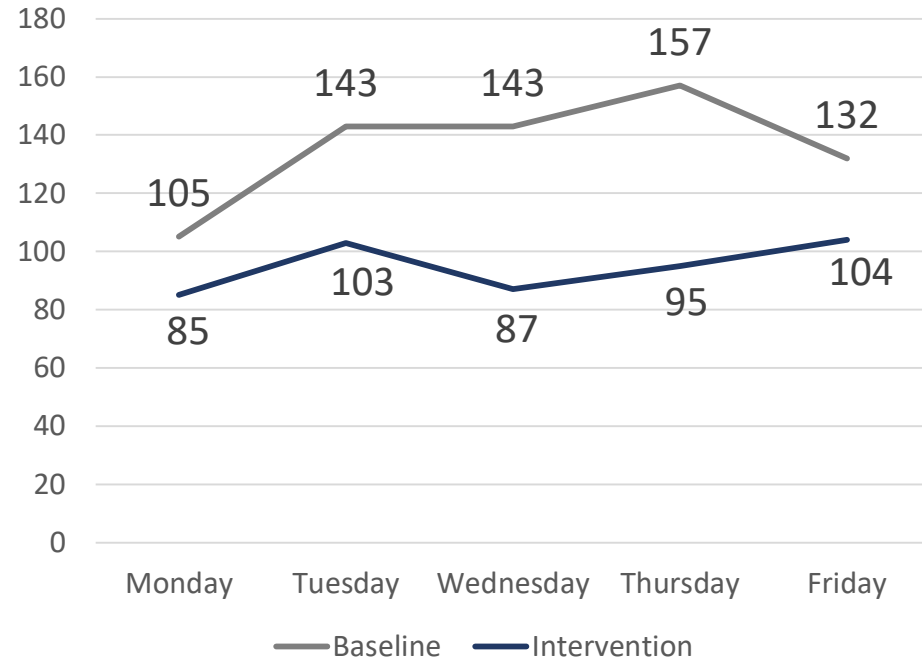
Data Analysis and Findings

High-Risk Postures- Weekly Trends

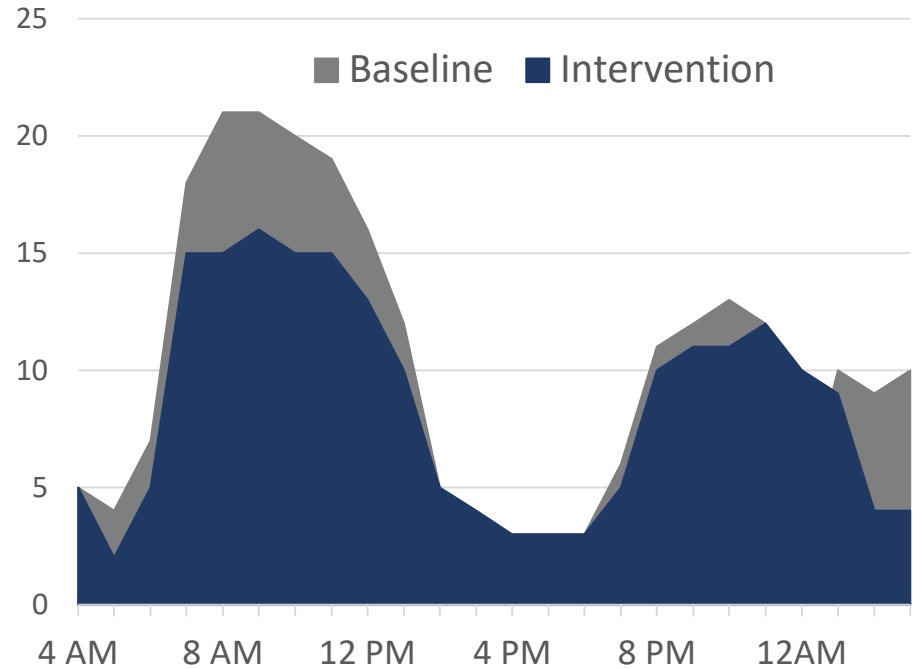


Data Analysis and Findings

High-Risk Postures by Day of the Week

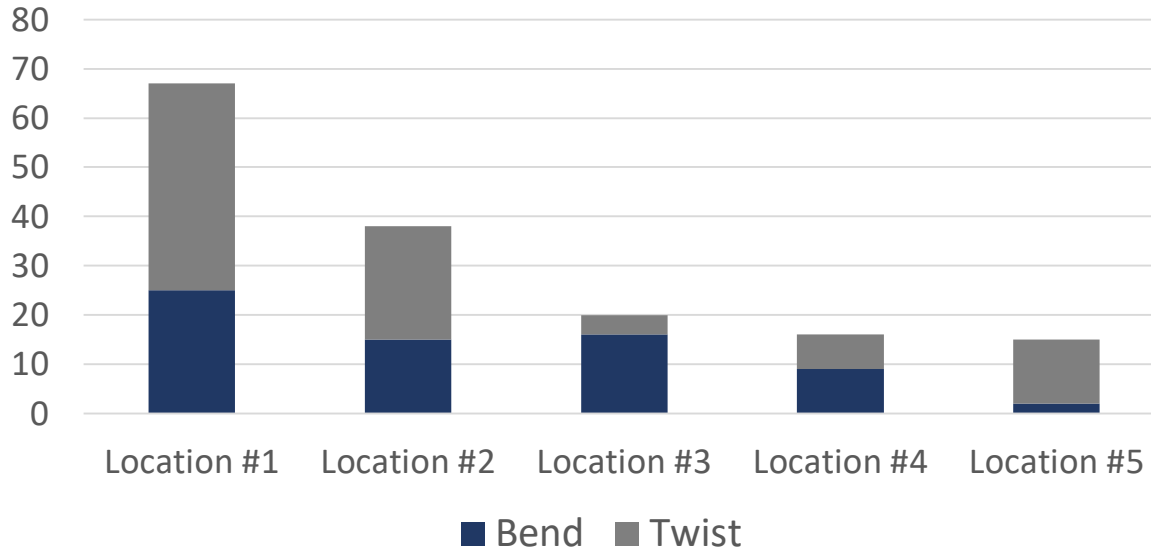


High-Risk Postures by Hour of the Day



Data Analysis and Findings

Delivery Drivers:
Location Based High-Risk Movements



Long Term Utilization + Scalability



Remote Employee Observation



Objective Metrics on High-Risk Postures



Ideal for Remote or Difficult to Observe Workforces



Identify High-Risk Movements Further Upstream



Improve Reporting and Trend Analysis



Objectively Measure Efficiency Improvements



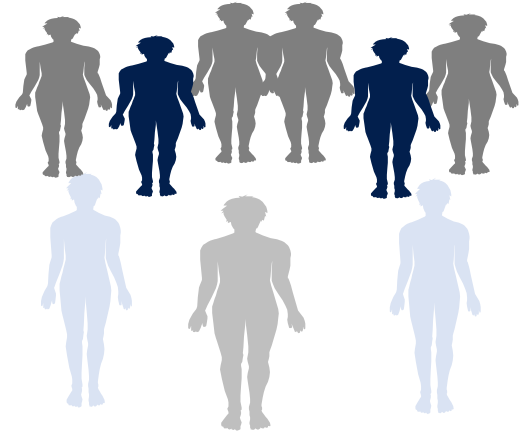
Drive Employee Engagement and Awareness

Data Informed Injury Prevention + Ergonomics

CURRENT STATE



FUTURE STATE



Targeted Interventions
Focused on Highest
Risk Employees

Future Utilization



IDENTIFY AREAS OF HIGH RISK

Individuals, Jobs
and Tasks



IMPROVE EMPLOYEE AWARENESS

Self Tracking and
Monitoring



IMPROVE REPORTING CAPABILITIES

Site-Wide Analysis
of Objective
Movement Trends

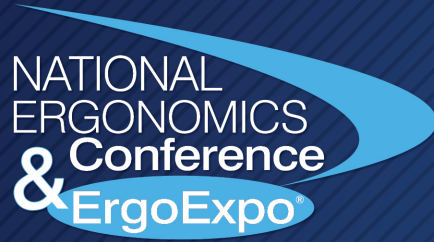


PROVIDE DATA DRIVEN INTERVENTION

Individualized and
Targeted Strategies



**Think of Wearable Sensors as a
TRIGGER for Interventions**



A Wearable Technology Case Study- Identification and Mitigation of Risk in a Distribution Center

Presented by: Kelson Wann, MS ATC FMS
Briotix Health