

Increase your Productivity with these Ergonomic Principles

Presented by:

Rob Doucette

Jeff Hoyle



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BOSTONtec



Ergonomic Workstations



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Presenters



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Objectives

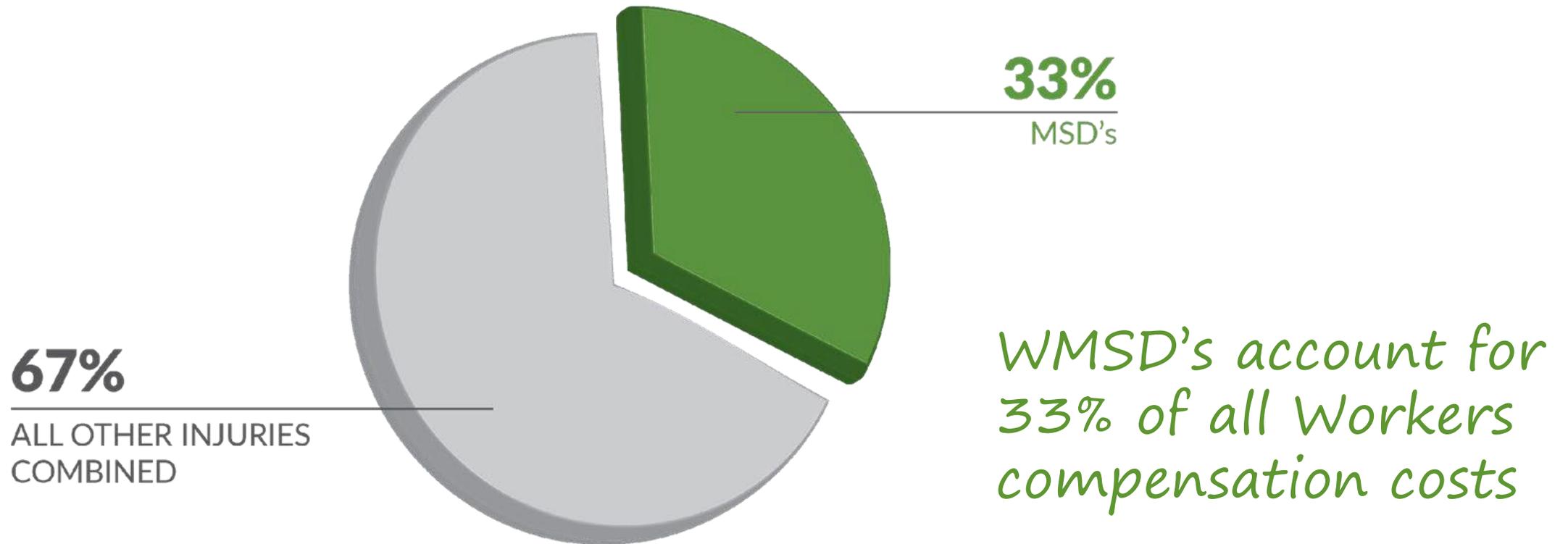
- **The Economics of Ergonomics**
- **Results of Washington State Department of Labor 250 Case Studies**
- **Principles to Consider when Designing an Industrial Workstation**
- **New Ergonomic Time and Motion Study**

The Economics of Ergonomics



Impact of Work-related Musculoskeletal Disorders (WMSDs)

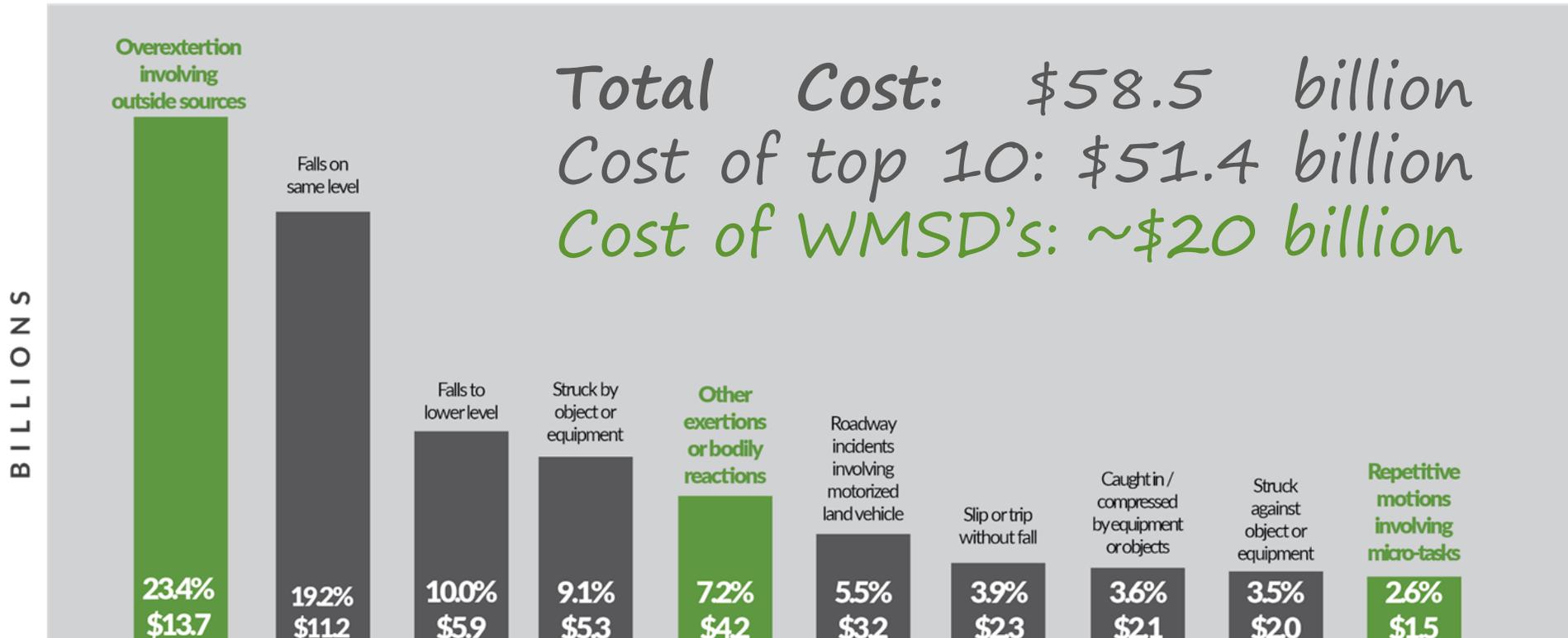
WMSD's are among the most frequently reported causes of lost or restricted work time.



Source: Bureau of Labor Statistics

Need for Ergonomics

Top 10 Causes and Direct Costs of the Most Disabling U.S. Workplace Injuries



Source: 2018 Liberty Mutual Workplace Safety Index

Costs of WMSD's

Indirect Cost of WMSD' are up to five times the direct costs

Direct Costs

Workers comp, medical & legal expenses

Indirect Costs

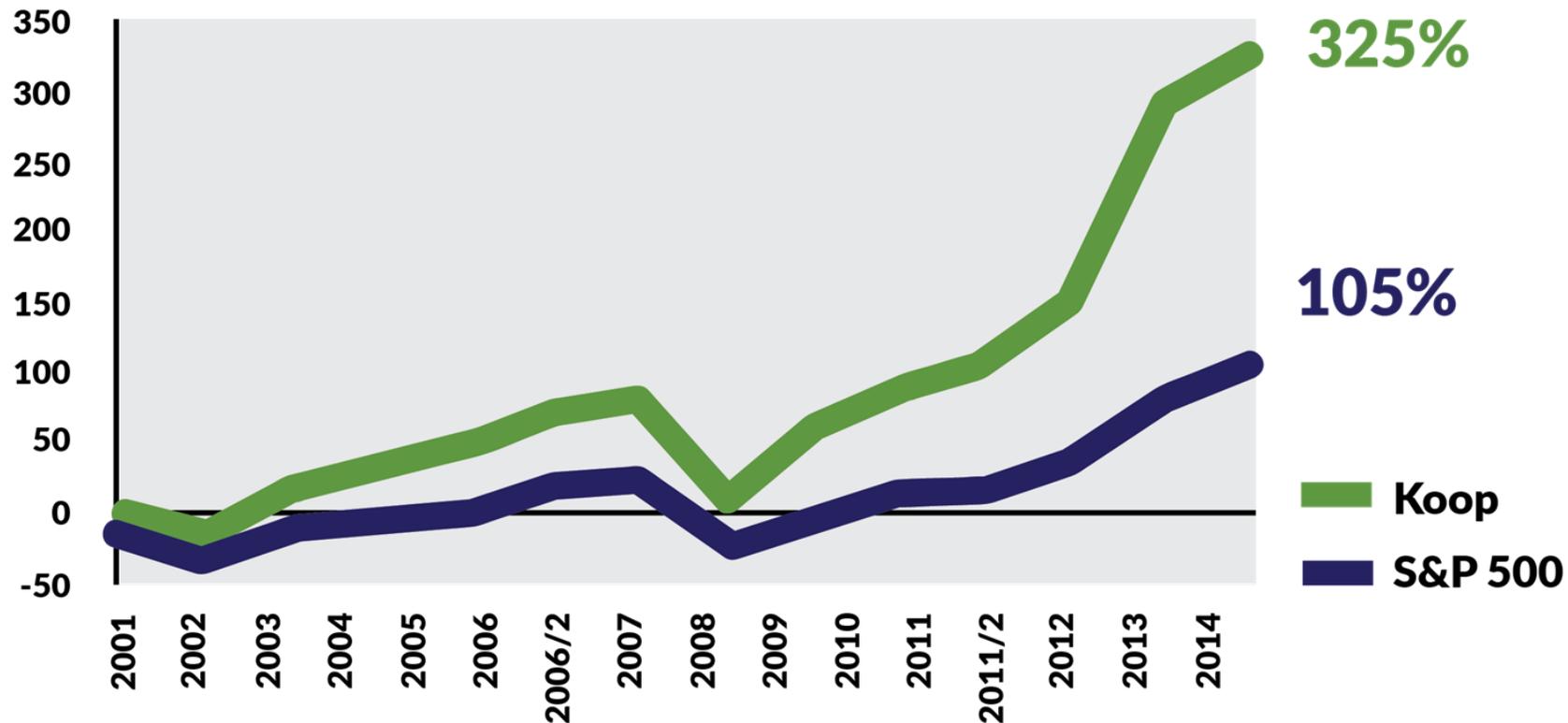
Training replacement, accident investigation, lost productivity, lower employee morale & turnover



Source: <https://www.osha.gov/safetypays/background.html>

Culture of Safety & Health

Tracking the Market Performance of Companies that Integrate a Culture of Health & Safety



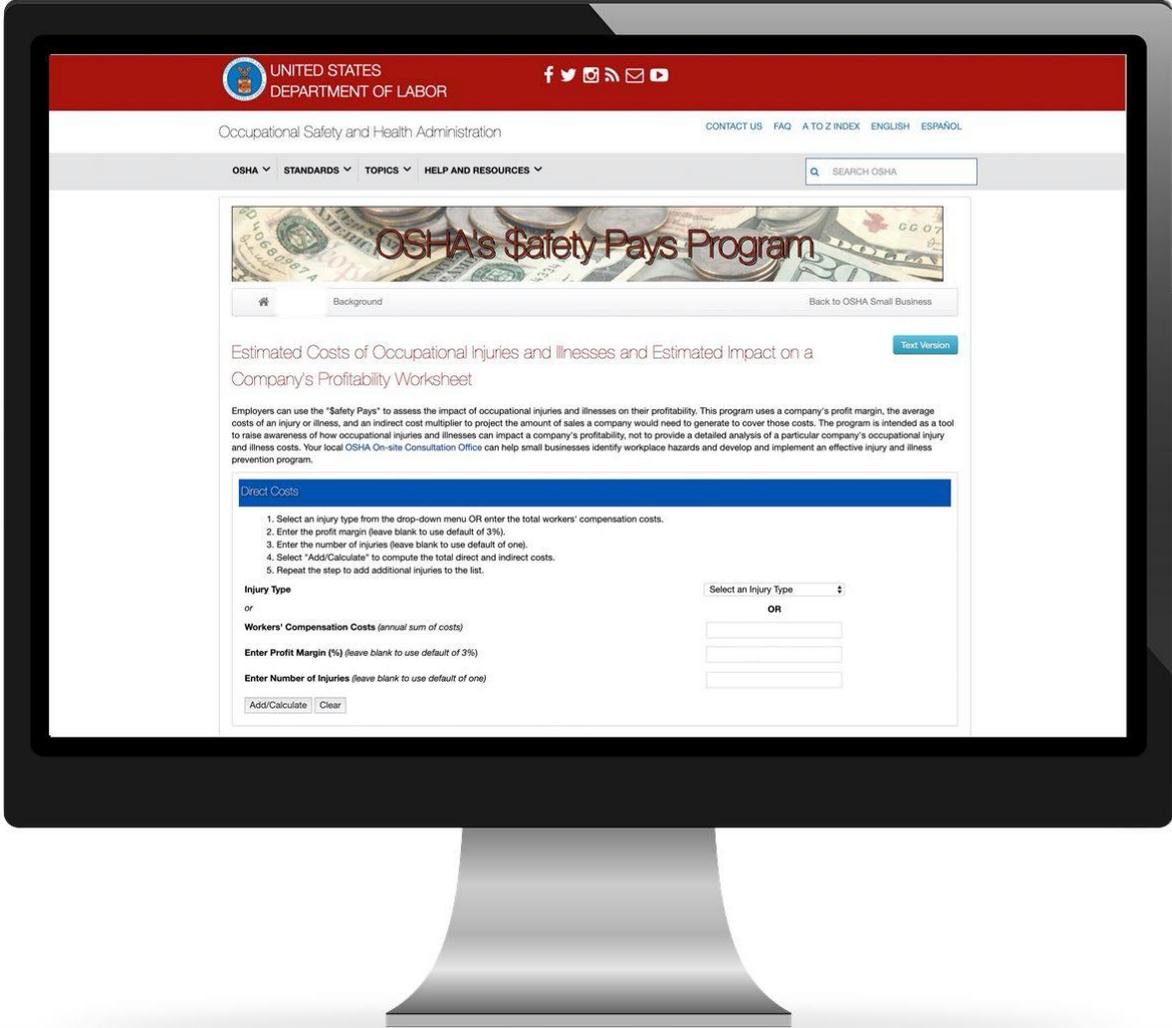
Source: *Journal of Occupational & Environmental Medicine*

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OSHA Calculator

Calculate the Impact of WMSD's on Your Business



Source: <https://www.osha.gov/safetypays/estimator.html>

250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

ERGONOMICS
Reduce Cost

250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

ERGONOMICS

Improve Productivity

POWERED BY POSSIBILITIES.



250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

ERGONOMICS

Improve Accuracy & Quality

POWERED BY POSSIBILITIES.



250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

ERGONOMICS

Improve Employee Engagement

POWERED BY POSSIBILITIES.



250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

ERGONOMICS

Create a Better Safety Culture

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250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

Metric	Number of Examples	Mean	Median	Range
WMSDs	90	59% ↓	56% ↓	8% - 100%
Lost workdays	78	75% ↓	80% ↓	3% - 100%
Workers' comp costs	52	68% ↓	70% ↓	15% - 100%
Productivity	61	25% ↑	20% ↑	-0.2% - 80%
Payback period	36	0.7 yrs.	0.4 yrs.	0.03-4.4 yrs.

Source: Washington State Department of Labor and Industries

250 Case Studies

Washington State Department of Labor and Industries Reviewed Effect of Ergonomics

Metric	Number of Examples	Mean	Median	Range
Quality (scrap/errors)	8	67% ↓	75% ↓	8% - 100%
Turnover	34	48% ↓	48% ↓	3% - 100%
Absenteeism	11	58% ↓	60% ↓	14% - 98%
Cost:Benefit ratio	6	1:45.5	1:10	1:2.5 - 1:140

Source: Washington State Department of Labor and Industries

Ergonomic Calculator

*Calculate Your
Ergonomic
Cost Benefits*

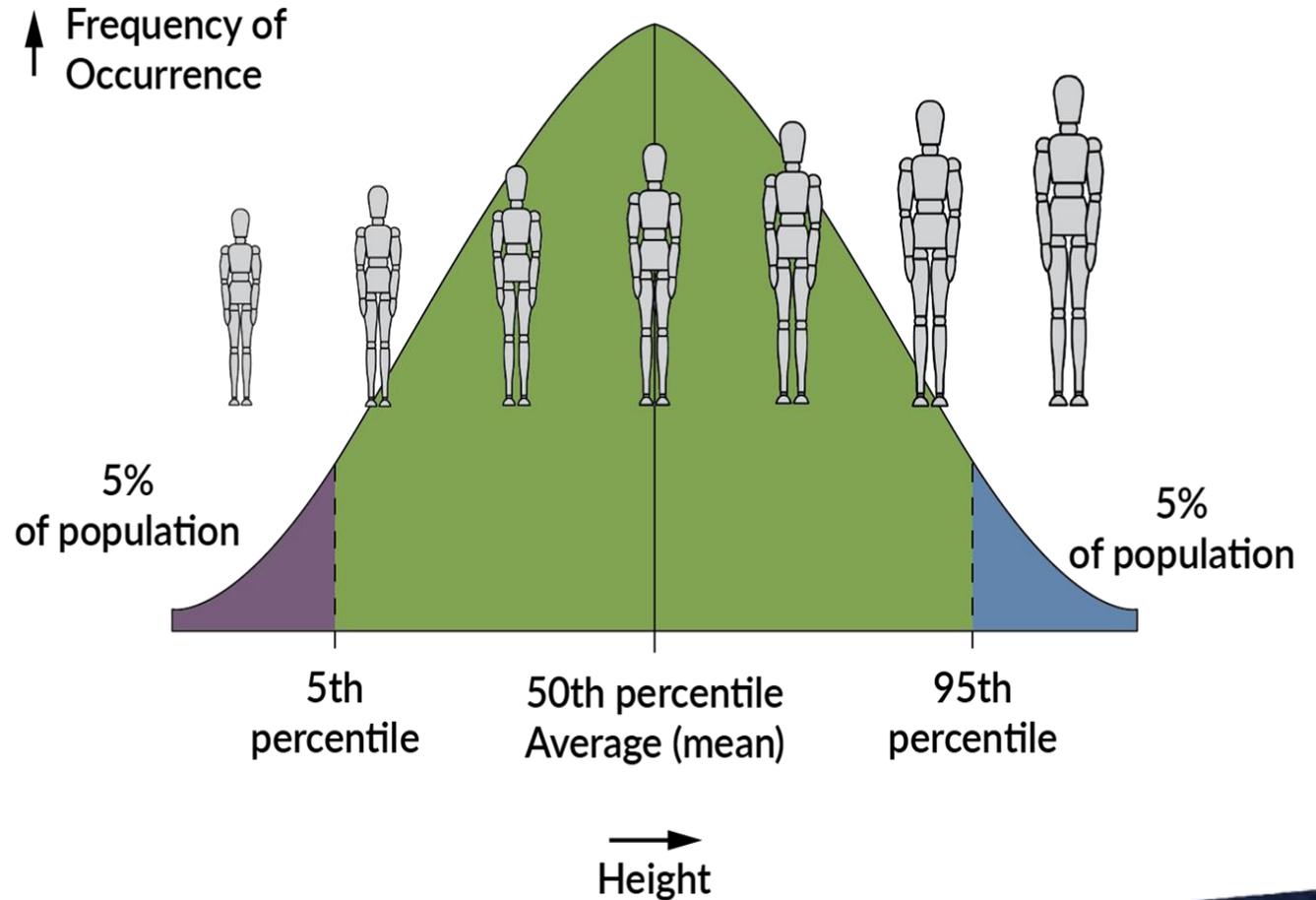
The screenshot shows the Ergonomic Calculator interface. At the top, it features the logos for the Washington State Department of Labor & Industries and the Puget Sound Human Factors and Ergonomics Society. The form includes the following fields and sections:

- Number of employees in this job/dept./org.:** [input field]
- Average hourly salary for these employees:** [input field] per hour
- Number of WMSD claims for this job/ dept./ org. per year:**
- This past year:** A table with columns for Type (Back strain), Number, and Typical costs (\$). It contains five rows of input fields.
- The year before:** A table with columns for Type (Back strain), Number, and Typical costs (\$). It contains five rows of input fields.
- 2 years before:** A table with columns for Type (Back strain), Number, and Typical costs (\$). It contains five rows of input fields.
- Total costs for year:** A column of input fields for each year's total costs.
- Average annual WMSD claim costs:** [input field]
- Estimated annual indirect costs:** [input field]

Source: <https://pshfes.org/cost-calculator>

Workforce Diversity

Challenges to workstation set-up and design.



Ergonomic Principles

- **Optimize Position**
- **Eliminate Extreme Movements**
- **Minimize Forces & Repetition**
- **Order & Color Coding**
- **Optimize Lighting**

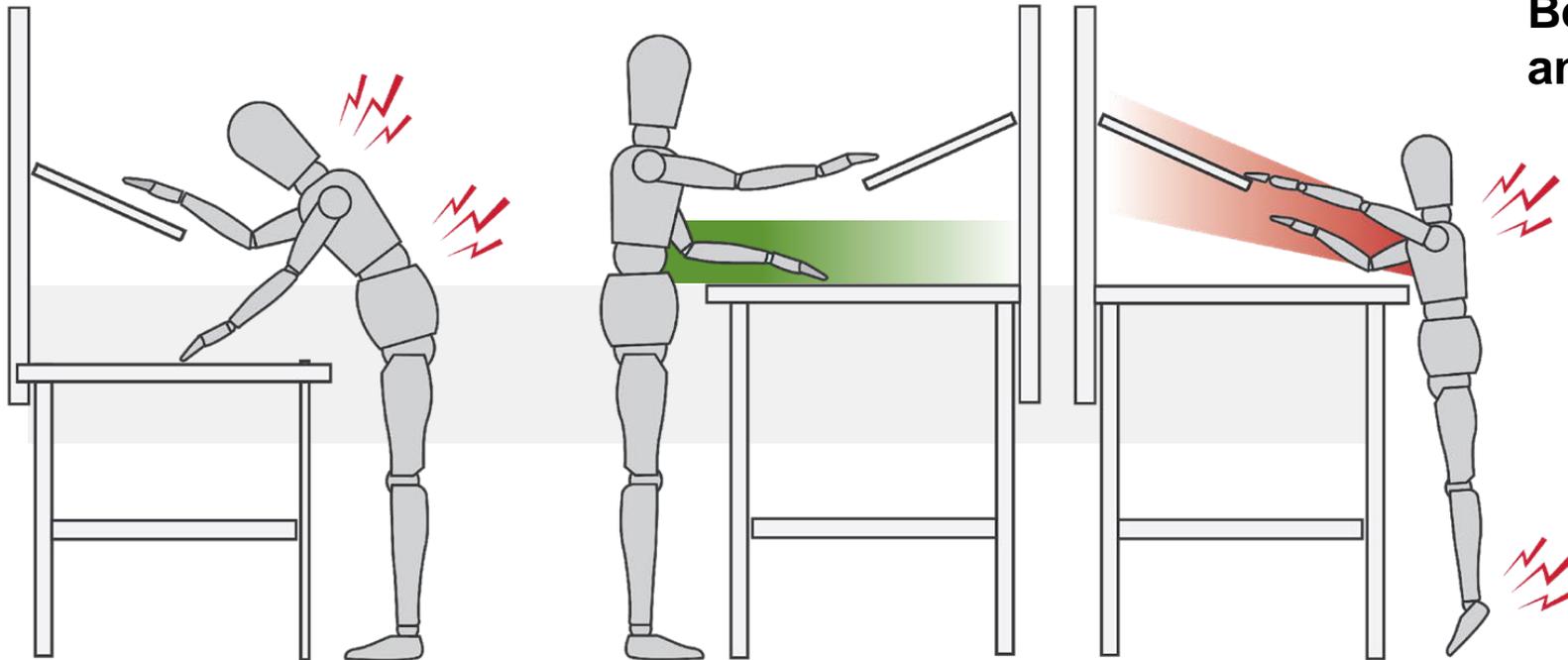


Optimize Position

Challenge:

Multi-Operator processes

Varying heights

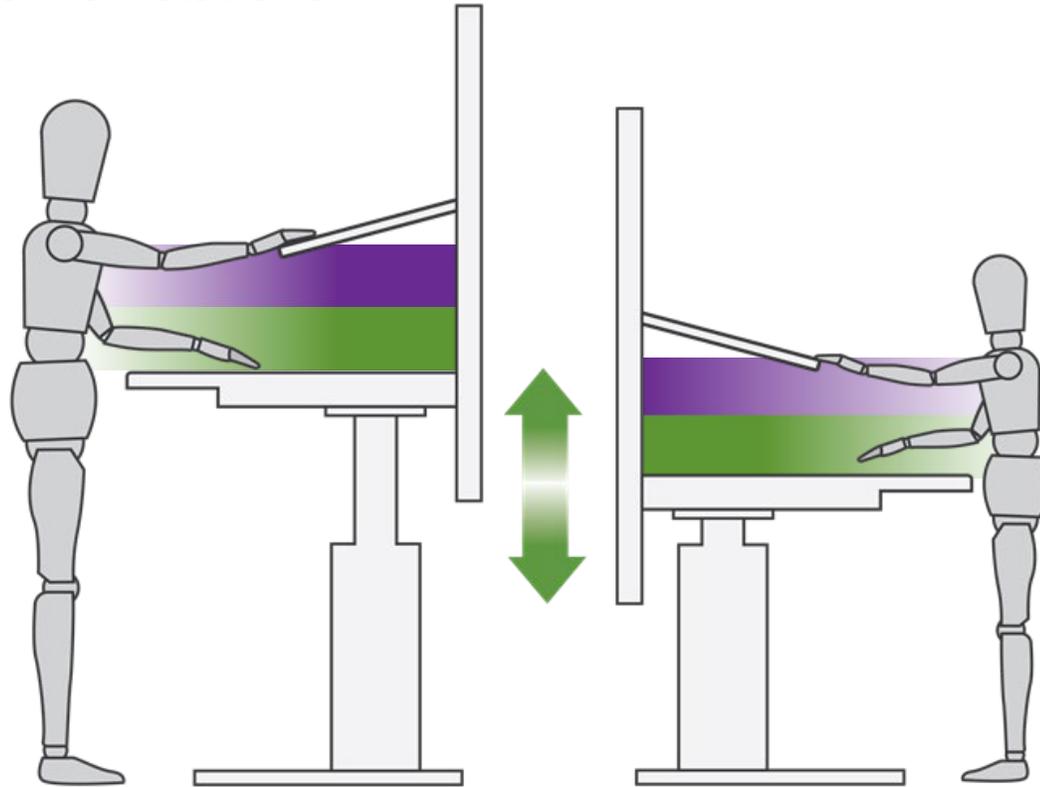


Danger Zone
Bending, stretching,
and/or reaching

Optimize Position

Solution:

Height-adjustable workstations

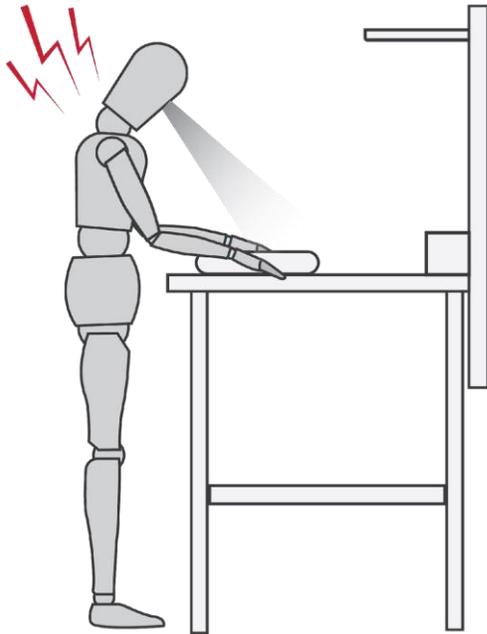


Neutral Position
Most operators stay
in 1st and 2nd zone

Optimize Position

Challenge:

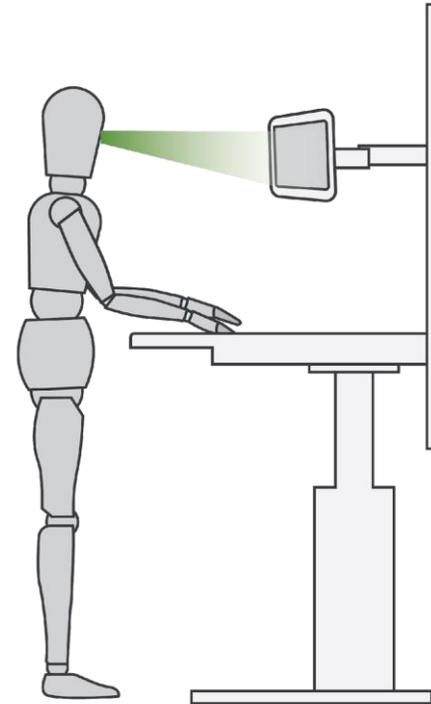
Position of work instructions or other documentation



Danger Zone
Neck bending

Solution:

Use monitor arms to position screens in correct height



Neutral Position
For body and neck

Optimize Position

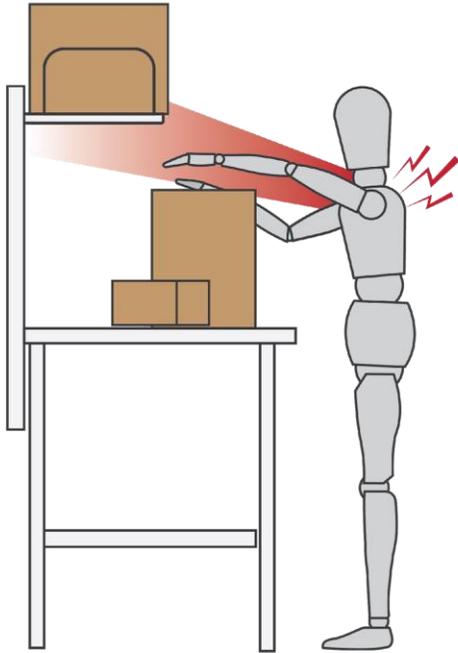
Accessories that help ensure an ergonomically sound position:



Eliminate Extreme Movements

Challenge:

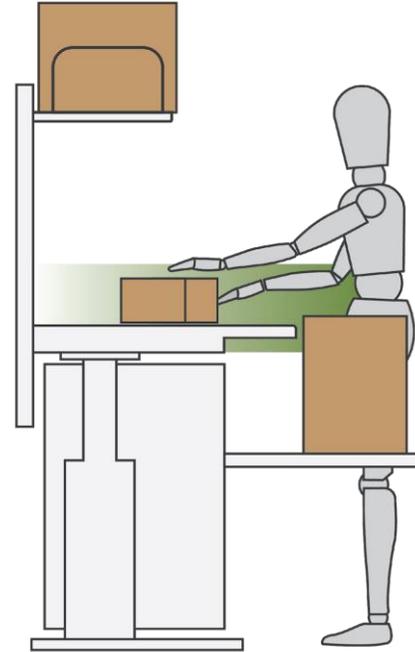
Box building and packaging of large boxes on work surface:



Danger Zone
Reaching
above the shoulder

Solution:

Under work surface shelving system:



Neutral Position
Keeping arms under
shoulder height

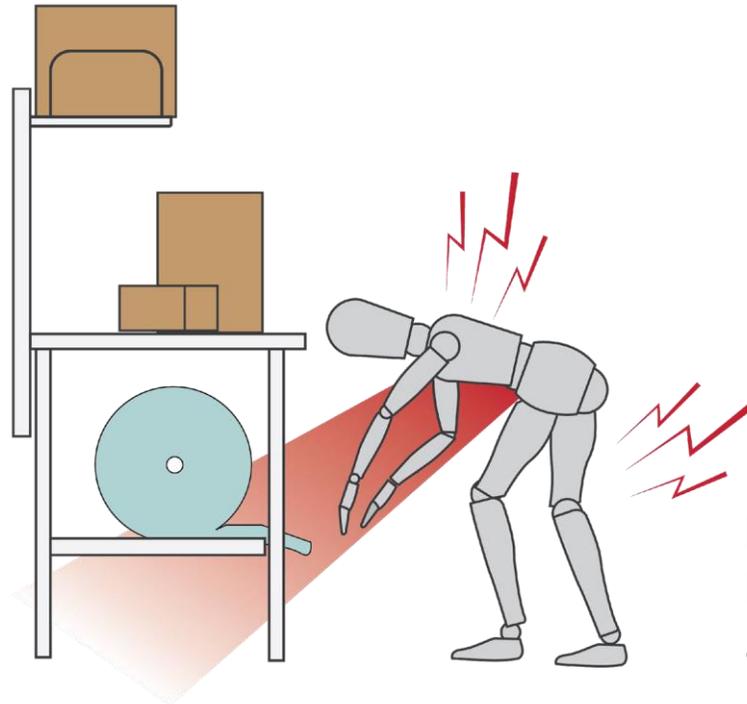
Eliminate Extreme Movements

Challenge:

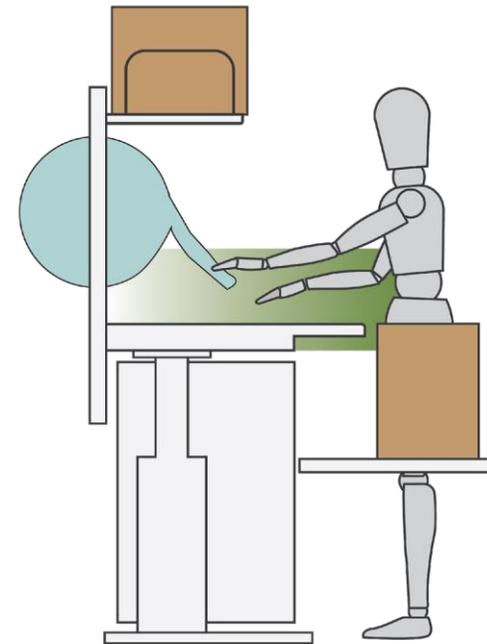
Store packing material under work surface

Solution:

Specialty holders / spools



Danger Zone
Bending hips
and waist



Neutral Position
Allows the body to
remain upright

Workstation Examples



Box Building Shelf

Spool Holders for Bubble-wrap



Corrugate Storage Cart



Label Trough

Printer Pull-out Shelves

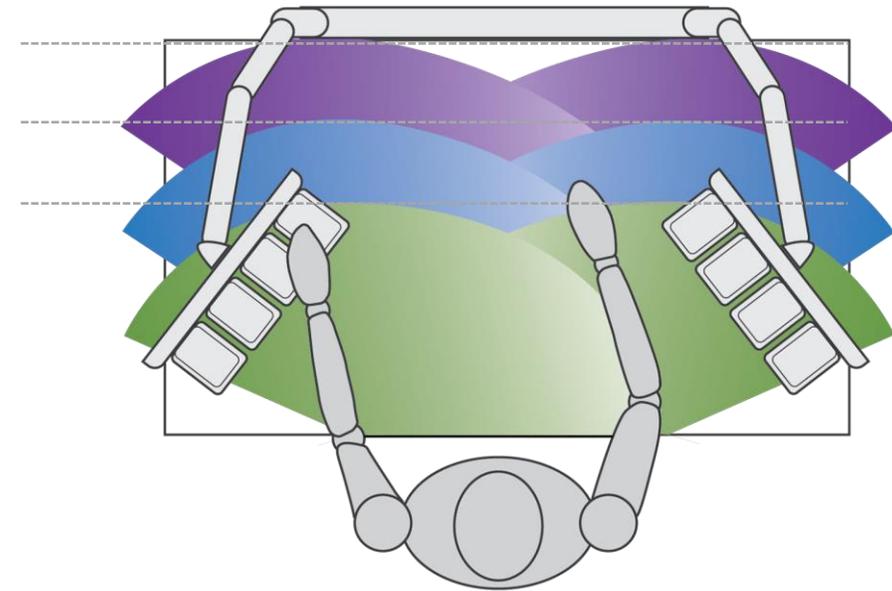
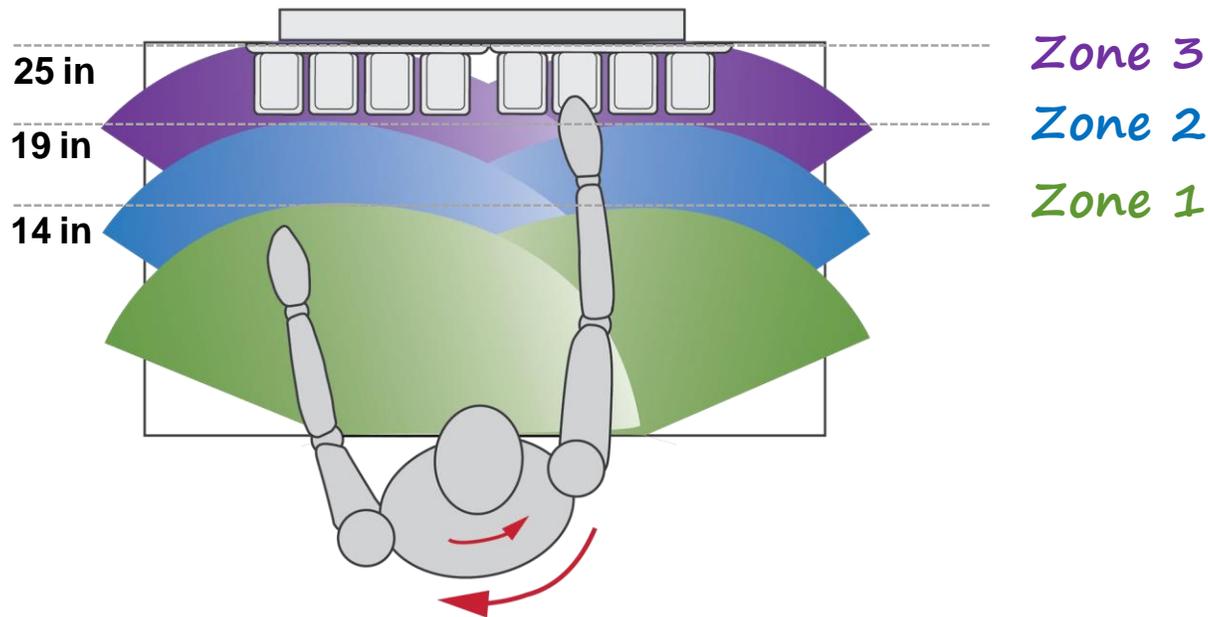
Minimize Repetitive Movements

Challenge:

Frequently used items for repetitive tasks placed at the rear of workstation forcing the operator to reach and twist to Reach **Zone 3**.

Solution:

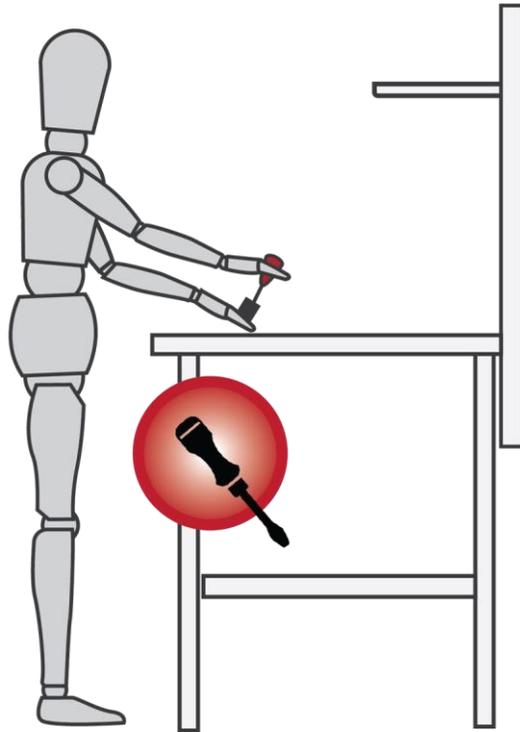
Arm and rail systems bring items into Reach **Zone 1**.



Minimize Forces and Repetitive Exertions

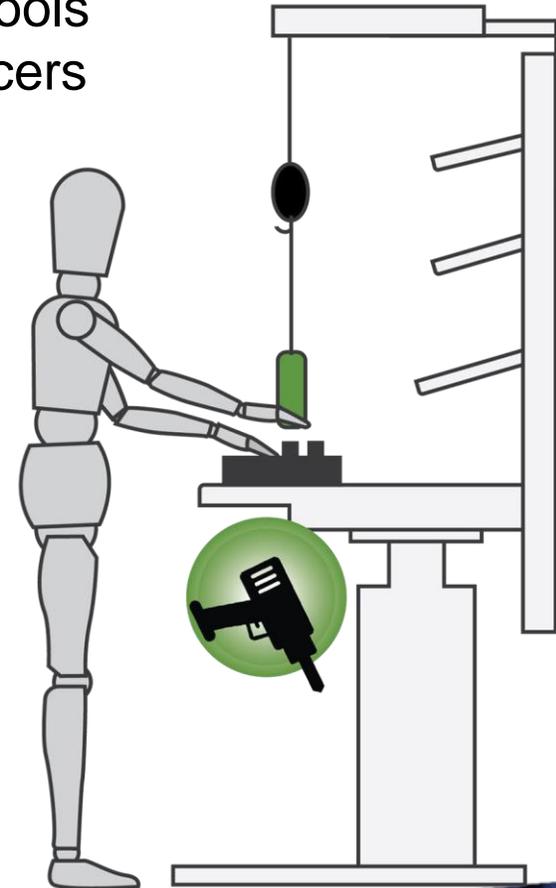
Challenge:

Repetitive motions
using manual tools w/o support



Solution:

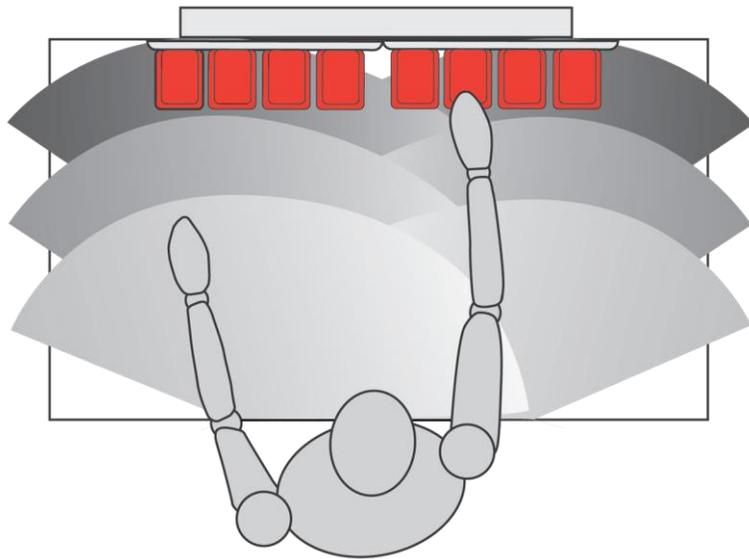
Powered tools
and balancers



Order and Color Coding

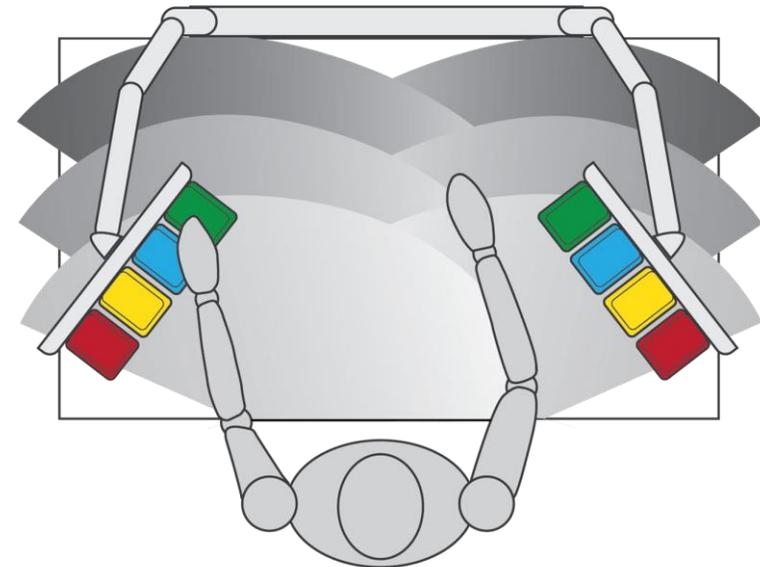
Challenge:

When variety of items is needed for work process, uniform color of bins challenges productivity and accuracy.



Solution:

Clear color coding and labeling. Order top to bottom, left to right for sequencing.



Workstation Example

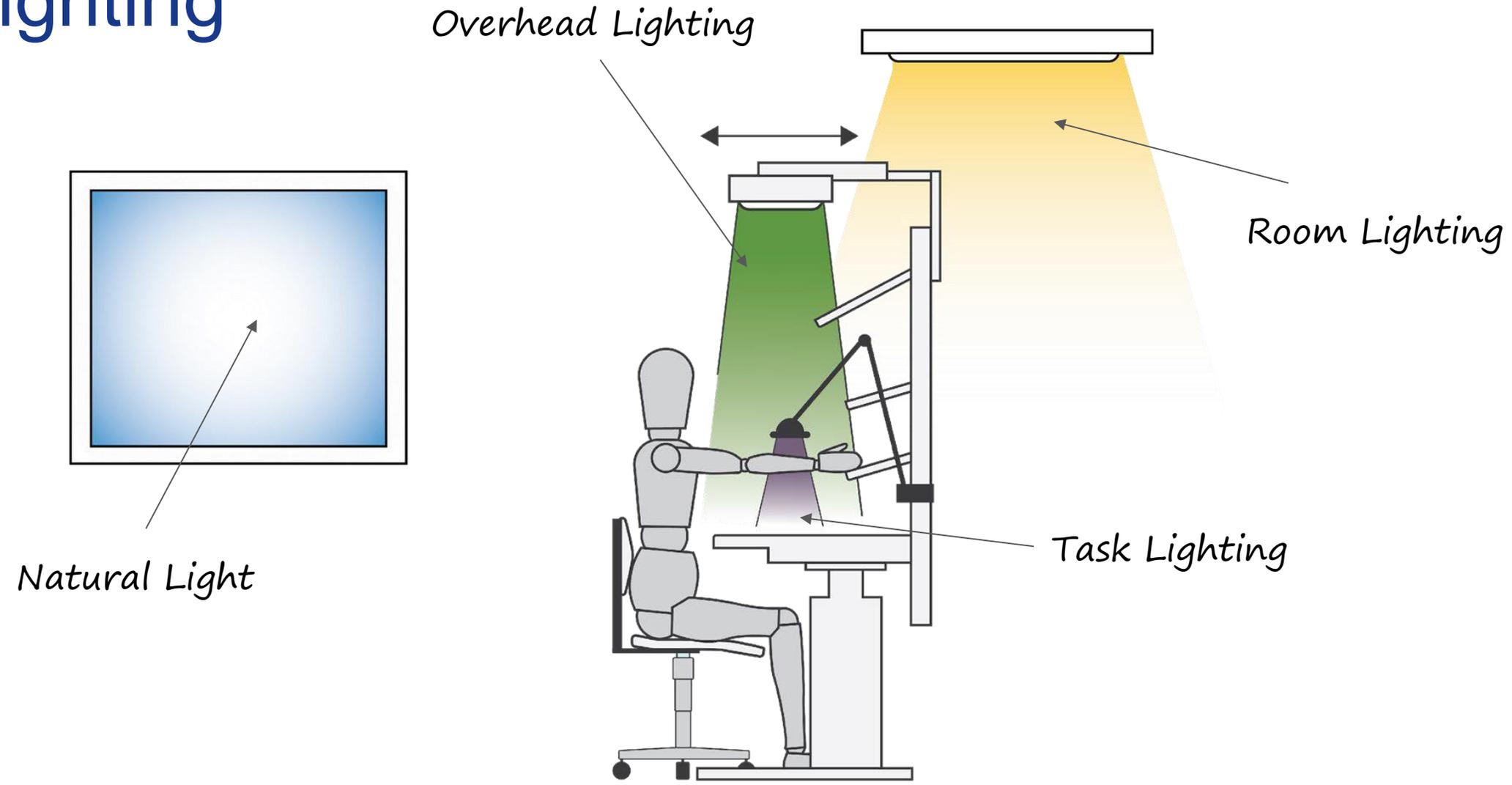
Tool Track with
Trolley and
Balancer



Bin Rail with
Color-coded Bins

Articulating Bin
Holder

Lighting

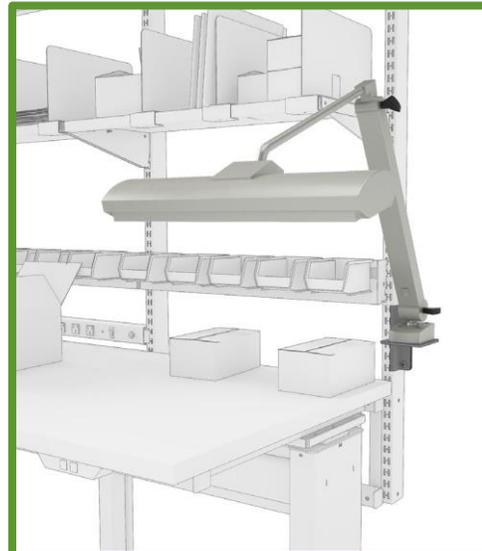


Lighting

Accessories that help provide ergonomically sound lighting:



LED Overhead Light



Task Light



LED Ring Magnifier



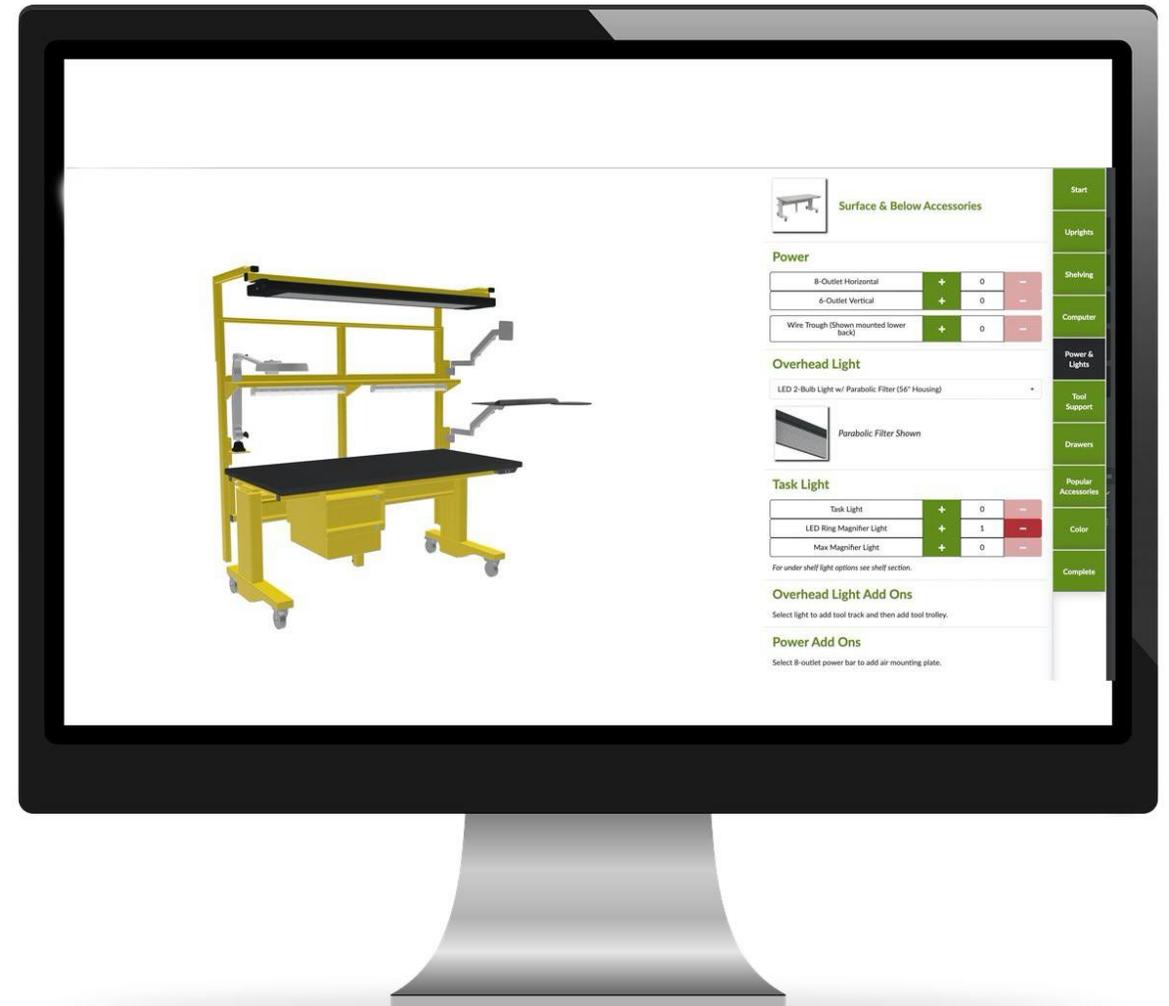
Max Magnifier

Workstation Example



Online Configurator

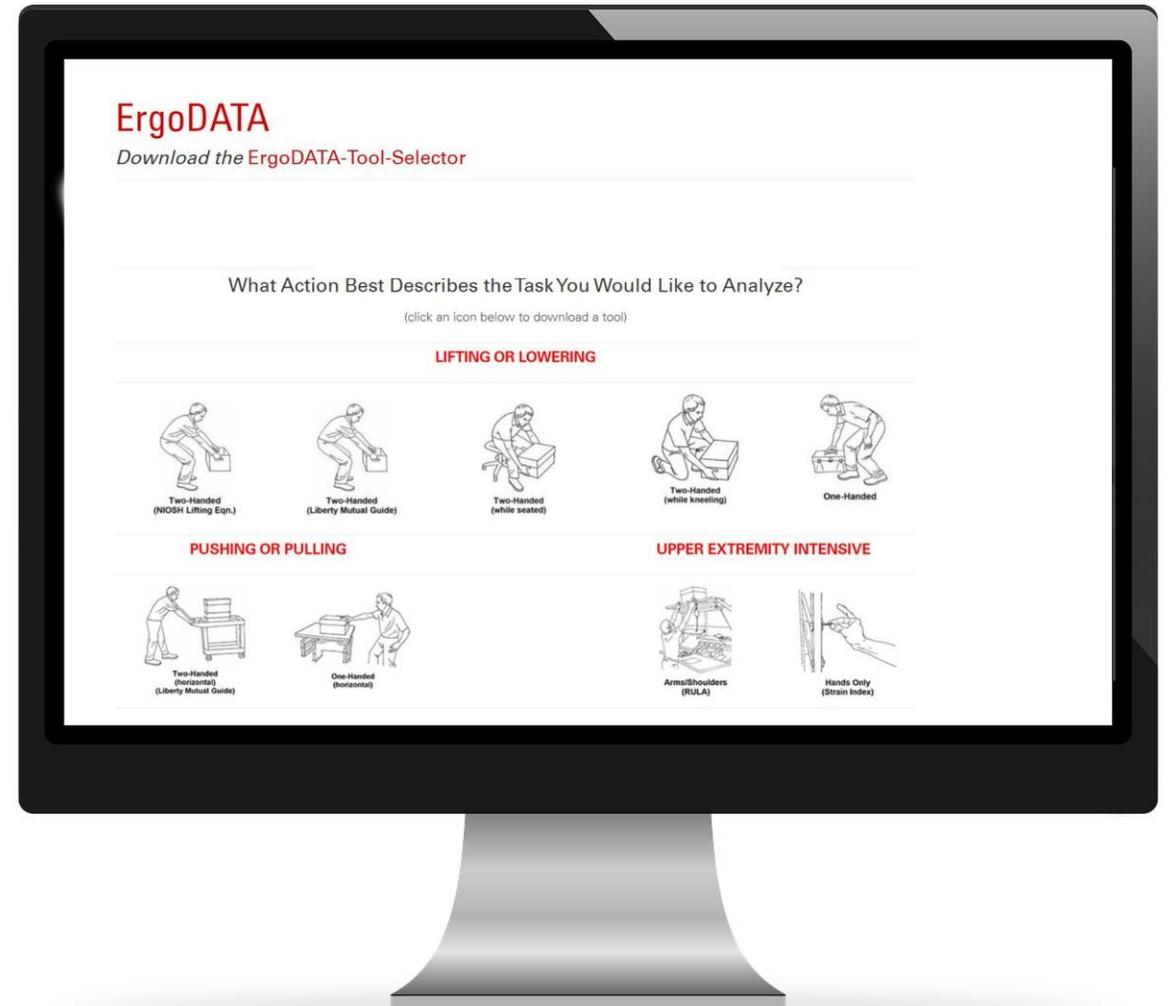
Easy-to-use Online Configurators Help You Plan Ergonomic Details of Your Workstations



Source: <https://www.bostontec.com/design-workstation/>

Task Analysis Tool

FREE, online suite of assessment tools designed to assist your company in providing the best analysis of your operations and tasks.



Source: https://www.ergocenter.ncsu.edu/resources_tools/ergodata/

New Ergonomics Time & Motion Study

The Ergonomic Center North Carolina State University

- Conducted in November - December 2019
- Ten subjects (5 M, 5 F), varied height, weight, BMI
- Typical assembly task: Cycle time <5 min
- Typical fulfillment task: Cycle time <3 min
- One workstation in traditional, fixed-height set-up
- One height-adjustable workstation following ergonomically sound principles

New Ergonomics Time & Motion Study

Objective Measures:

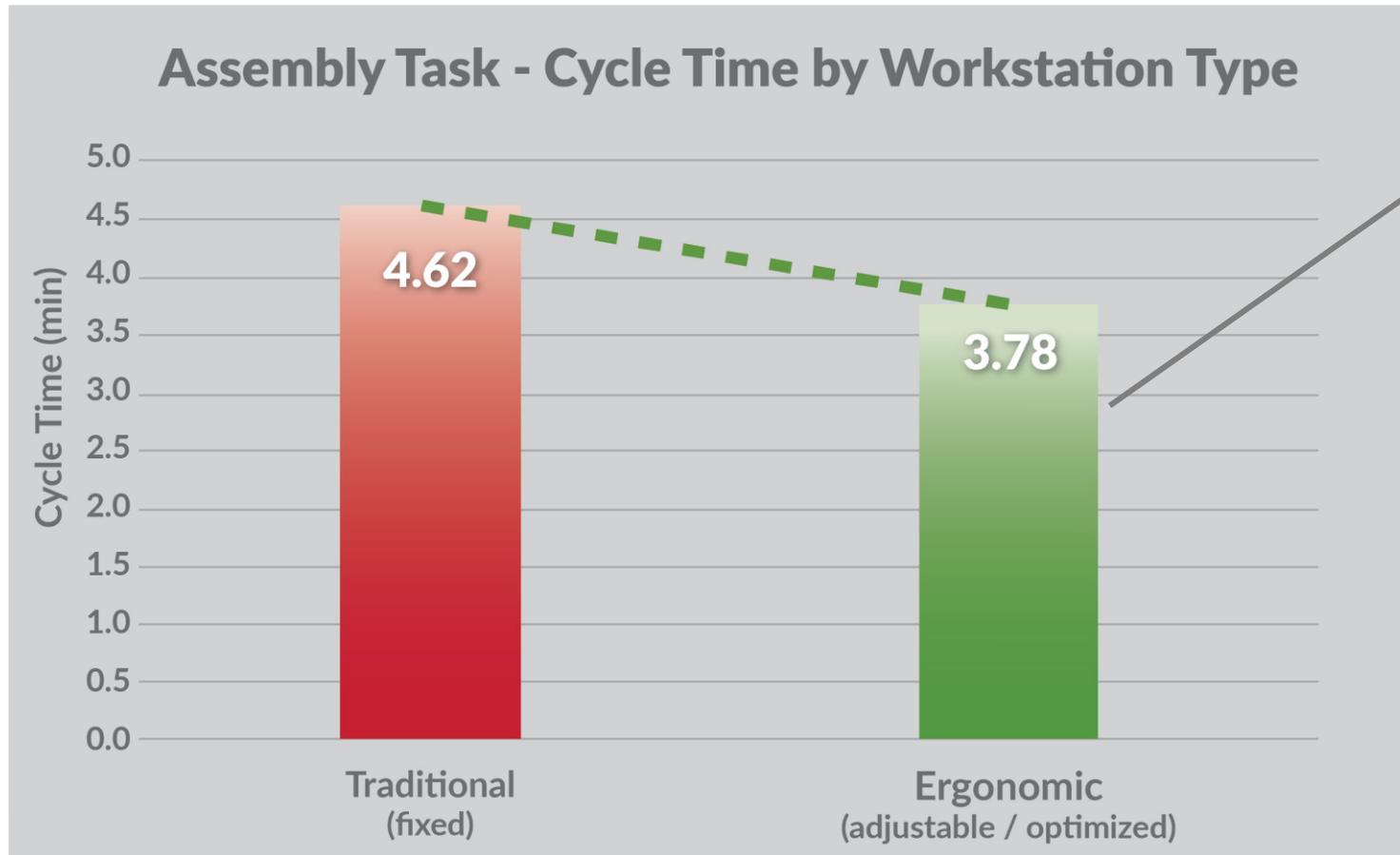
1. Productivity / time differences
2. Motion differences
 - a) Total No. of upper extremity motions
 - b) No. of upper extremity value-added motions
 - c) No. of upper extremity non-value-added motions
3. Ergonomic risk differences:
 - a) No. of reaches outside of acceptable reach zones
 - b) REBA or RULA scores - risk differences

New Ergonomics Time & Motion Study

Subjective measures:

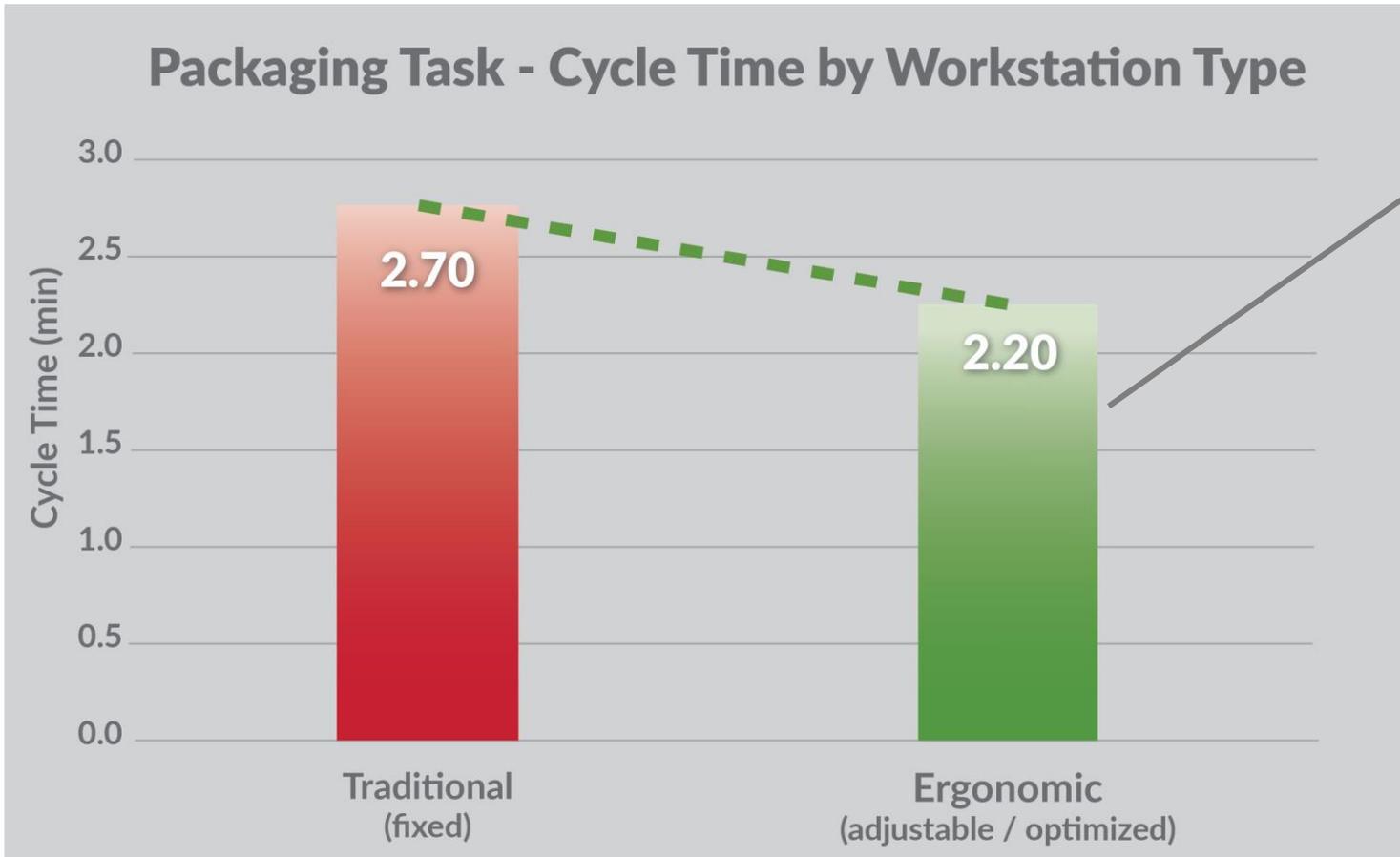
1. Performance preference (rank order workstation type)
2. Comfort preference (rank order workstation type)
3. Ease of use (System Usability Scale)
4. Participants open comments/feedback

Results: Productivity (Cycle Time)



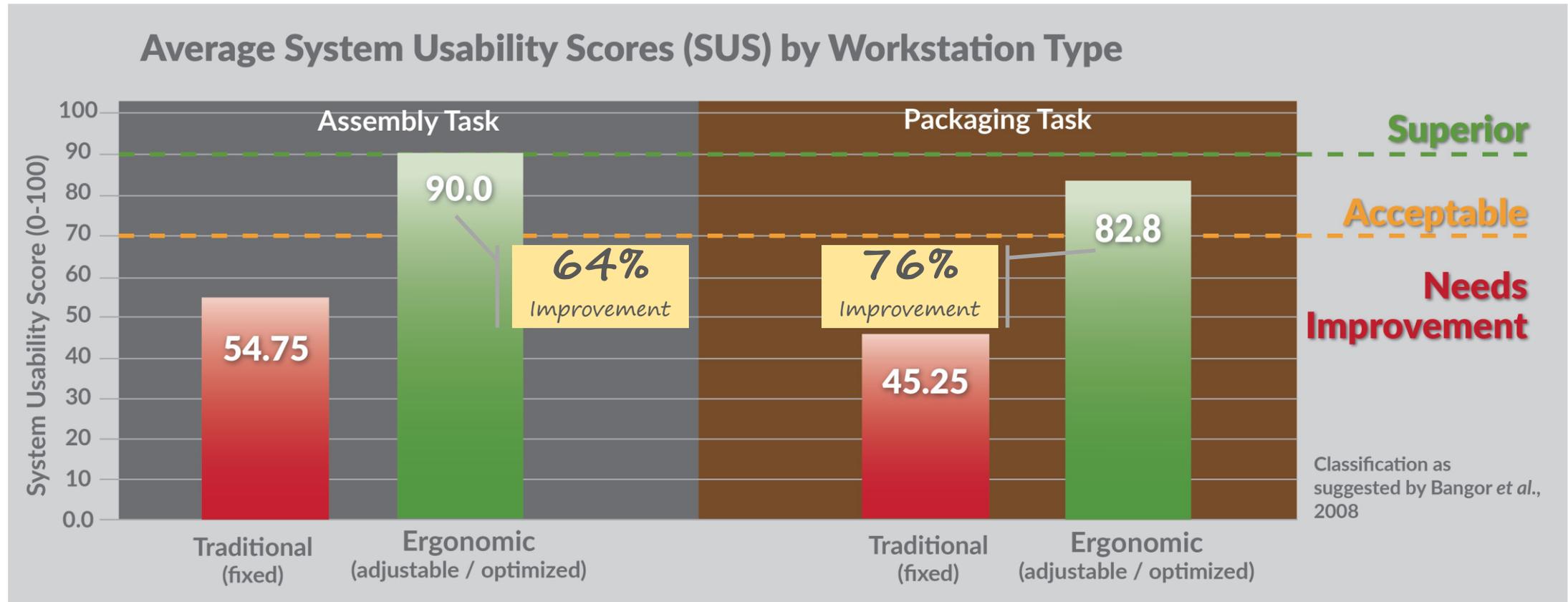
18%
Improvement

Results: Productivity (Cycle Time)

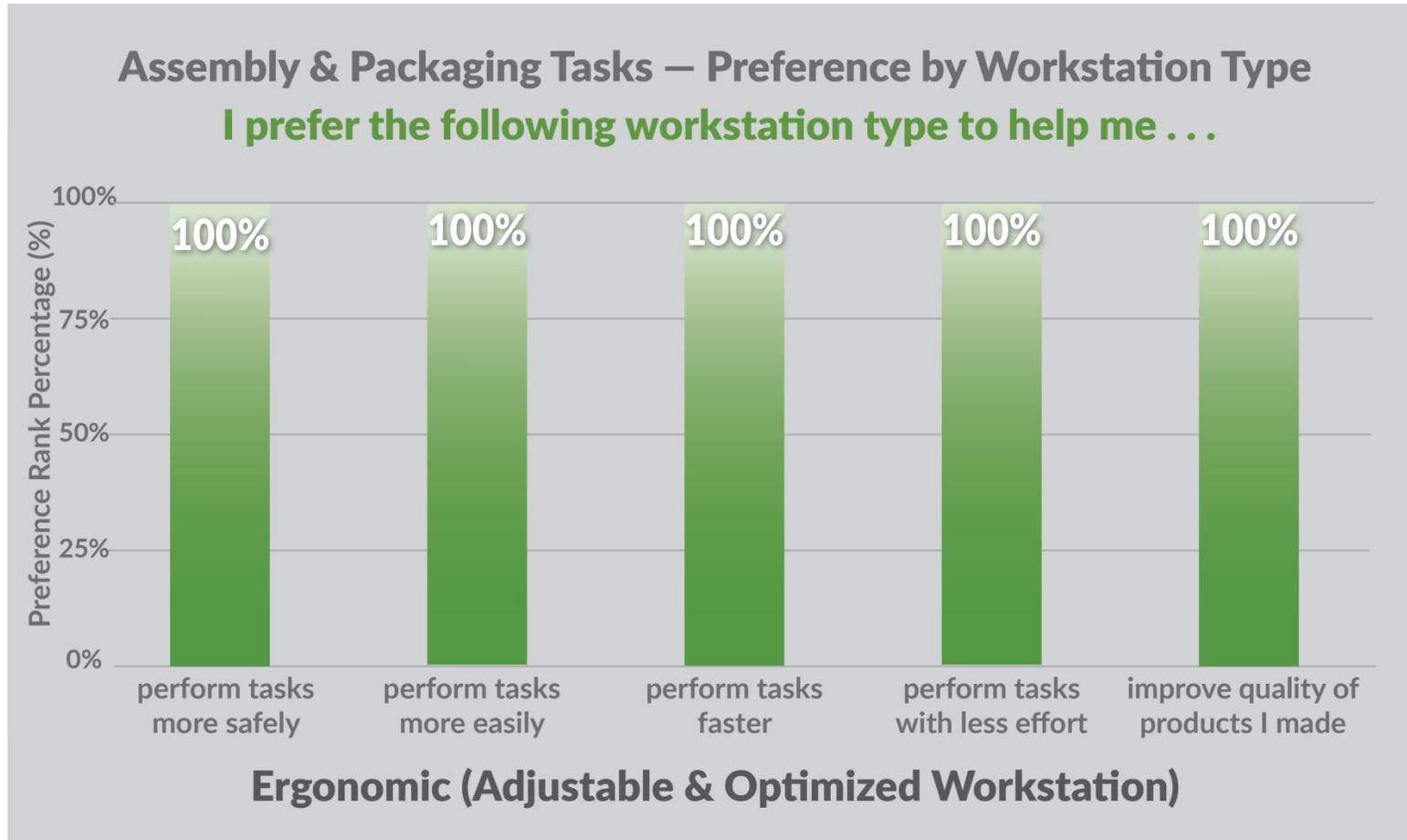


18.5%
Improvement

Results: Ease of Use (System Usability Scale)



Results: Performance Preference



Q & A

Examples of Custom Workstations



Examples of Custom Workstations



Examples of Custom Workstations



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