

Practical Strategies for Improving Ergonomics

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Occupational ergonomics is the science of improving employee performance and well-being in relation to job tasks, equipment, and environment. It is a relentless pursuit and continuous effort to design the workplace for what people do well, and design against what people do not do well, thereby fitting the job to the person to enhance human performance and prevent work-related musculoskeletal disorders (WMSDs).

The goals of ergonomics are simple and straightforward and can best be explained through a simple metaphor. The need to operate a machine within a specified set of limits is self-evident:

- If we operate a machine within the limits of its design, we will achieve optimal productivity.
- If we consistently operate a machine outside of its limits, the machine will be unreliable and eventually break down.

We can apply a similar logic to people. Because the ergonomics discipline provides us with formal definitions of the cognitive, physiological, and biomechanical capacities of the human, we can apply the information to optimize productivity while avoiding WMSDs through workplace design:

- If task demands and the work environment are designed to accommodate our biological capacity, the human will achieve optimal human productivity and minimum error.
- If task demands require a person to operate continuously outside of his or her capacity, the human will perform the work unreliably and eventually break down.

Hazards for WMSDs have been well documented by NIOSH and the National Academy of Sciences. Despite ongoing political rhetoric, there is sufficient scientific research to identify ergonomic risks and measure exposures. The difficulty comes in identifying effective countermeasures once hazard exposures have been pinpointed. Below are five solution strategies for identifying effective improvements once you've identified ergonomic challenges and have completed evaluations.

1. Ask Why Five Times

Solution development begins with a clear problem statement. Use the "five whys" to determine root causes for ergonomic hazard exposures such as awkward postures, forceful exertions, and repetitive motion.

1. Why is the operator reaching across the conveyor? To reach the parts bin.
2. Why is the parts bin located across the conveyor? Because there is no room for it in front of the conveyor.

3. Why is there no room for the parts bin? Because that area is used to store the tools for this operation.
4. Why are the tools stored there? Because this station does not have a tool balancer on which to hang them from overhead.
5. Why is there no tool balancer? Because no one had thought to put one in.

2. Posture, Force, Frequency

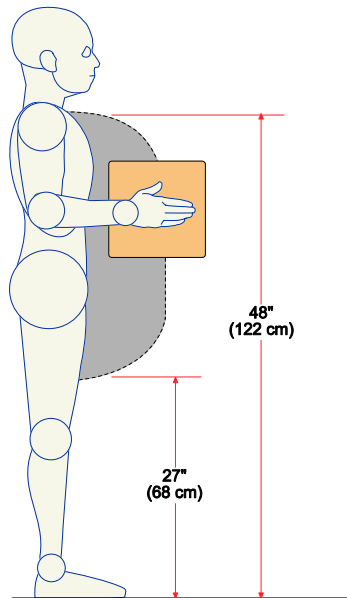
Awkward postures, excessive forces, and high frequency of motions are the primary risk factors for WMSDs. They are also great leading questions to generate simple solutions:

- What can be done to reduce exertion forces? Many times manual tools can be replaced with power tools, or material handling aids such as transfer carts and hoist systems can reduce forceful exertions.
- What can be done to minimize frequency of movement? A review of the steps needed to complete an operation will often highlight many non-value-added activities such as restacking parts before transferring them to a press. Reducing these non-value-added activities can eliminate steps that contribute to a high frequency of motions.
- What can be done to eliminate awkward postures? Poor postures are often the easiest to address through simple workstation component rearrangements, and eliminating posture problems can make forceful or repetitive movements tolerable.

3. Comfort Zone

Working near the limits of a joint's range of motion is difficult and increases exposure to ergonomic risk. Everyone performs best when working in an area directly in front of the torso called the **Comfort Zone**. This area is where we are the strongest, possess and execute the most control, and have the best visual acuity. In addition, working inside the Comfort Zone may also reduce the time required to perform a work activity because unnecessary movements are reduced or eliminated.

The Comfort Zone is made up of the natural, semi-circular movements or motions of the human body. A combination of both horizontal and vertical movements, the Comfort Zone extends from mid-thigh (27") to the shoulder (48"), within easy reach of the front of the body.



4. Tool/Target

Ergonomic issues are the result of a mismatch between the workstation and the employee and/or the tool used in the work activity. Changing either the tool that is used or the target location can improve many posture issues. It is important to note that ergonomic improvements often occur by changing both the tool and the target.

Change the Tool

Tools are designed for specific applications in a specified direction. If the wrong tool is used to complete a task, the operator may resort to non-neutral postures such as wrist deviations and shoulder raising. It is important to select and use a tool that is appropriate for the specific work activity to promote more neutral body postures.

Following are general guidelines for tool selection and design:

- Use pistol grip tools when applying force horizontally, on a vertical surface
- Use in-line tools when applying force vertically, on a horizontal surface
- Lengthen or shorten handles and tool bits to bring the reach to the tool into the operator's Comfort Zone
- Provide a secondary tool handle for better control and improved postures
- Balance tools and orient them in the direction of use

Change the Target

If the proper tool cannot be used, the target orientation may be changed to fit with the tool and promote neutral body postures. Ways to modify the target include the following:

- Provide a jig or fixture to orient the part for easy access
- Provide adjustable height tables

- Establish a Standard Operating Procedure (SOP) to ensure that people use the equipment the way it was designed to be used

5. Ask the Operator™

The simplest solution strategy may also be the most effective—ask the person who does the job if he or she can think of a better way of doing it. Operators know the ins and outs of their job tasks better than anyone else, and they often bring a great deal of clarity to the search for solutions.

Powerful questions to gain greater insight into an operation include:

- What is the least desirable or most difficult part of this operation?
- While performing this operation, do you experience any pain or discomfort?
- What suggestions do you have for improving this work area?
- Are there any quality or production issues associated with this operation?

About the Author

Mike Wynn, CPE, is a vice president and ergonomics engineer for Humantech, Inc. Since 1979, Humantech has assisted companies throughout North America in successful ergonomics initiatives in a variety of workplace settings including production and assembly, offices, and laboratories. Through a clear focus on low-cost workplace improvements that produce quantifiable savings, Humantech clients benefit from Health and Safety improvements and business results. For additional information related to successful ergonomics programs, visit Humantech's web site, www.humantech.com.