Addressing ergonomic hazards through behavioral observation and feedback[1.]

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Abstract

A behavioral observation and feedback process should be an integral component of a comprehensive approach to identifying and managing ergonomic hazards. Systematic behavioral observation and analysis can supplement other *hazard identification and analysis tools*. Routine behavioral observations conducted throughout the work environment identify situations in which ergonomically-unsound work practices occur. Job-specific behavioral observations may then be conducted as part of a detailed analysis. Subsequently, the observation process serves as a *hazard reduction tool* by providing peer feedback needed to encourage and reinforce the use of ergonomically-sound work practices.

This paper will:

- review the key elements of a comprehensive ergonomics program,
- present a brief overview of a behavioral observation and feedback process,
- show how a behavioral observation process supports an ergonomics program, and
- describe a training strategy for preparing behavioral safety observers to become effective at identifying ergonomic-related safe and at-risk situations.

Traditional Approach to Managing Ergonomic Risks

Traditional approaches to managing ergonomic-related illnesses include strategies to identify and then reduce exposure of employees to ergonomic hazards. An ergonomics *training* program is conducted to allow individuals to be active participants throughout the identification and elimination of ergonomic hazards. Instructional programs typically teach employees to recognize and report the early warning signs of ergonomic-related injuries, understand the basic ergonomic risk factors (e.g., repetitive motion, forceful exertions, sustained or awkward positioning) and use simple strategies to prevent ergonomic injury (e.g., proper seated posture, appropriate lifting techniques).

An *ergonomics hazards analysis* of the worksite is performed to identify existing and potential hazards. A thorough analysis includes:

(a) a review of injury and illness records to identify patterns and trends indicative of ergonomic hazards,
(b) the administration and analysis of a "symptom survey" to identify employees experiencing early symptoms of an ergonomics-related injury,
(c) the administration and analysis of a “job/task survey” to pinpoint situations where tasks are performed for an extended duration and/or with sufficient frequency to raise concern,

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(d) a self/peer workplace evaluation that allows employees to assess and adjust their own and/or others' workstations,
(e) a global workplace audit by an ergonomics specialist, including interviews with representative samples of workers, and
(f) a detailed analysis of those situations identified in parts (a)-(e) as having a high risk potential.

Once ergonomic hazards are identified and prioritized through a systematic worksite analysis, corrective actions can be planned and taken. *Risk reduction strategies* typically include engineering and work practice controls, personal protective equipment, and administrative controls. Engineering controls include designing or modifying the workstation, tools, and equipment used in performing the work. Traditional work practice controls involve modifying work methods and operating procedures, followed by specific ergonomics training for the recommended changes. Administrative controls include rotating employees on and off certain jobs, modifying task schedules, and enlarging or enriching assignments.

Once the initial efforts are complete, *program maintenance* includes periodic refresher training and re-administration of the peer/self evaluation instrument and the symptom survey. Follow-up analysis and work/workstation redesign and adjustment are performed as needed. In addition, steps should be taken to ensure that ergonomics principles are used in the selection and design of new equipment and workstations, and that ergonomics considerations are incorporated into the identification and modification of job tasks to accommodate injured employees returning to work.

While the hazard identification and reduction techniques described are necessary components of a comprehensive ergonomics program, they are often insufficient. Even the best designed tools and workstations are frequently misused, either intentionally or unintentionally, even after well designed and delivered ergonomics training. A behavioral observation and feedback process can be used to complement the traditional techniques, forming a more comprehensive approach for identifying and controlling ergonomic risks.

An Overview of A Behavioral Observation and Feedback Process

A behavioral observation and feedback process is a tool designed to help gain visibility and understanding of safe and at-risk behaviors. Using a checklist containing a list of pre-determined critical safety-related behaviors specific to the organization, employees periodically observe the work practices of one another while on the job, noting occurrences of both safe and at-risk behaviors. Following the observation period, which typically ranges from 10 to 20 minutes, the observer and observee discuss the observer's results. The observer reviews the work behaviors s/he noted as having been performed safely, and using appropriate coaching techniques, reviews any behaviors which appeared to put the individual at risk of injury.

In addition, the observer/observee pair informally assesses the particular work context to identify any specific barriers to working safely. Possibilities might include environmental hazards, equipment or tool design deficiencies, training inadequacies, communication failures, or time constraints. With the results of the objective observation, they collectively problem-solve to reduce or eliminate these barriers and therefore allow and/or encourage the safe alternative behavior.

The completed checklists are periodically collected and compiled. The compiled data are charted and shared with employee groups, providing a second form of constructive feedback. The data charts illustrate strengths and weaknesses of individual groups and/or the organization as a whole. Frequently occurring at-risk behaviors and/or those most likely to result in severe injury are studied in further detail. Teams assess the work situation to identify any environmental or design hindrances to performing a target behavior safely, and to derive ways to reduce or eliminate these barriers and thereby enable or facilitate safe behavior. After careful analysis, teams develop, implement, and measure the impact of the behavior-improvement interventions. These might include redesigning a workstation, obtaining more comfortable, more effective, or more available PPE, streamlining operating procedures, or training and supporting particular work practices.

Often, there are no systems barriers discouraging or preventing the safe behavior. Or, at least the conditions which make at-risk behavior uncomfortable or inconvenient cannot be removed. In these situations, constructive peer feedback can help reduce at-risk work practices in other ways. Individuals often perform at-risk behaviors without willful intent, either because the proper way to perform the behavior is not understood or a lapse in attention or mindfulness enables an at-risk activity. That is, we can sometimes be "unconsciously incompetent" (Geller, 1999). In such cases, feedback provides *information*, making us aware of the risk we are exposing ourselves to so that we can work to change that behavior in the future.

Observer: _____ Date: _____

Department: _____ Time: _____

Operating Procedures	Safe	At-Risk	Comments
PPE Using personal protective equipment (e.g., eye glasses, hearing protection, gloves, hard hat).			
Housekeeping Work area maintained safely (e.g., trash and scrap picked up, no spills, walk-ways clear, materials and tools organized).			
Using Tools and Equipment Correct tool for the job; proper use; tool in good condition.			
Body Positioning/Protecting Positioning/protecting body parts (e.g., proper posture, avoiding line of fire, avoiding pinch points)			

Figure 1. A checklist is used to guide the observation.

Feedback can also be motivational. It provides *social support* to encourage an individual to take the time and extra effort to perform behaviors in the safe manner. Sometimes people purposefully choose to work at risk (i.e., " consciously incompetent"), usually because the at-risk behavior is easier, faster, and/or more convenient than the safe alternative. Heavy emphasis on meeting work schedules and production goals often further encourage at-risk behaviors, as does the impression that many others also take the particular calculated risk. Although a chance of injury exists, it is perceived as highly unlikely. So at the time, a decision to take the seemingly "minor" risk seems reasonable. In these cases, peer observation and feedback provides an accountability system to encourage and motivate people to perform safe rather than at-risk behaviors.

Finally, when positive feedback is provided by peers following the occurrence of safe behaviors, this soon and positive consequence will likely reinforce the worker's behavior, making it more likely to occur again. In this way, "conscious competence" is supported and increased, eventually becoming second nature, or "unconscious competence".

Integrating Behavioral Observation into an Ergonomics Program

As part of an ergonomics program, a behavioral observation and feedback process can serve two distinct and critical functions. First, the observation process can supplement other *assessment tools* used to identify ergonomically-hazardous situations. As illustrated in the sample checklist shown previously (Figure 1), an organization's general observation checklist typically includes one or more ergonomics-related behavioral categories such as "Body Positioning and Protecting", "Pacing of Work", and "Manual Materials Handling". This checklist therefore guides observers to identify safe and at-risk occurrences of ergonomics-related behaviors. In addition, job- or task-specific checklists can be designed and used to provide more guidance to the observer interested in examining more specific ergonomically-sound work practices. An example is shown in Figure 3. And because a behavioral checklist is used on a frequent basis (perhaps as often as once per week by each employee on a work team), the process can help uncover ergonomically-unsound situations which may be overlooked by a more traditional ergonomics assessment protocol which is usually performed infrequently, if at all. As the data pinpoints work areas or tasks where at-risk behaviors occur more frequently, the skilled ergonomist can assist the work team in conducting an even more through and detailed analysis.

In addition, the observation process can serve as a *hazard reduction tool* by providing individual and group feedback to encourage and support the use of ergonomically-sound work practices. For example, behaviors such as those involved in safe lifting or maintaining correct seated posture are seldom performed in an at-risk manner intentionally. Rather, individuals simply fail to attend to their posture and form because they are attending to other parts of the task at hand. As a result, even those who can recite the elements of safe lifting in their sleep are often guilty of not using these well-learned procedures. Likewise, well-designed and adjusted office furniture is often misused as weary computer users gradually slide further and further down into their chairs. A behavioral observation and feedback process which provides a means for frequent feedback can help individuals become aware of these unintentional at-risk behaviors so that they can work to become more fluent at the safe behavior and eventually develop a safe

Tool Use	Safe	At Risk	Comments
Using proper tool for the job Using the tool as it was designed to be used Tool is in good working condition (sharp)			
Using proper PPE (& proper fit) for use with the tool			
Maintains a neutral wrist position			
Maintains a neutral arm and shoulder position			
Use does not require excessive repetitive movement of finger(s), thumb, wrist, elbow, or shoulder			
Use does not require frequent forceful exertion (static or dynamic)			
Use does not require prolonged static position			
Use does not expose user to excessive vibration			
Pinch points are guarded			
Does not put excessive pressure on any part of hand (sharp edges; handle grooves; end of handle resting on palm) Heavy tools (> 1lb) are properly balanced Heavy tools (> 6lbs) used with two hands and/or are supported			
Potential for "kickback" is minimized (e.g., clutch brake mechanism and reaction bar)			
Designed and adjusted to minimize torque transmitted to wrist (eg. torque reaction bar)			
Tool handle is not either too hot or cold; Exhaust from power tool is directed away from operator			
Tool handle is not prone to slipping (moisture, smooth surface)			
Use of pinch grip is minimal			
For 2 handle tools: - does tool open easily (e.g. spring-loaded) - can hand or fingers be pinched between handles when closed - is grip span 2 in. - 3.5 inches For circular handle tools: - if tool used for precision work, diameter is 0.3 in - 0.6 in - if full hand power grip is required diameter is 1.25 in - 2 in.			
For tools with trigger mechanisms: - can different finger operate trigger - does it require static force - does it present sharp edges - does it require repetitive finger trigger actions			

Figure 3. A checklist can be designed to focus on specific types of ergonomic hazards.

habit (Geller, 1999).

Of course, not all ergonomically-risky behaviors are unintentional. Sometimes, people knowingly lift loads heavier than they should, use a tool that is handy but inappropriate for the task, or work at a pace that puts them at risk for a cumulative trauma disorder (CTD). Here, the observation process can help reinforce the need to follow ergonomically sound work practices by providing a systematic mechanism for peers to remind one another of safe work practices.

Training Observers to Identify Ergonomic Risks

The potential contribution of a behavioral observation and feedback process to a comprehensive ergonomics program, however, is limited unless the individuals performing the observations know what to observe. An introductory ergonomics course can be effective in teaching observers to identify the more apparent ergonomically-hazardous situations. But, to prepare observers more fully to identify ergonomically at-risk behaviors, a more comprehensive training approach is usually needed. While the issue could be avoided by having only the ergonomist or safety professional conduct observations, much of the value of a *peer-peer* observation process (e.g., utilize the strength of peer influence, increase informal feedback between coworkers, increase employee involvement and ownership) would be lost. One training approach for increasing the skills to identify ergonomically-hazardous situations tailored specifically for behavioral observation and feedback process participants is described below.

In introducing its behavioral observation and feedback process, a large manufacturing facility recognized the need to use the new system to help address ergonomic issues. After all, over one-third of their recordable cases during the past five years have been attributable to musculoskeletal disorders of one kind or another. So, as they rolled out their behavioral observation process, they customized it to focus on ergonomic issues. Specifically, the plant-wide observation checklist contained several categories which targeted ergonomic concerns, including “Body Positioning and Protecting”, “Manual Materials Handing”, and “Pacing of Work”. They had had an ergonomics program in place for two years, so their employees were aware of basic ergonomic principles. This introductory training, however, proved to be insufficient in providing observers the skills needed to identify the less obvious ergonomic hazards.

A subcommittee of hourly employees was formed to serve as the organization’s leaders in ergonomic observation and analysis. These individuals coordinate their efforts through both the behavior-based safety committee and the ergonomics committee. Members are currently participating in an extensive training program customized to help develop observation skills for ergonomic-related conditions. The program consists of a series of 12 mini-workshops, each of which lasts 45-60 minutes. One workshop is held each week. After an introductory session, the curriculum focuses on a different ergonomics issue each week, addressing a variety of ergonomic risk factors one-at-a-time. During the second week, for example, the target issue was posture. The course content contains a general description of the issue, supported by still photographs and video clips illustrating the concern taken within the facility. Video clips are also used to conduct “mock observations” in which participants practice observing for the target issue and then compare their results with those of the class and the instructor. During the week following the workshop, participants conduct periodic observations in their work areas, concentrating only on the targeted issue for the week.

At the end of these six weeks, the topical content of the workshops will shift to focus instead on different body parts. For example, the topic during the eighth week will be “Hands and Wrists”. During this week, participants will focus on all six ergonomic risk factors, but with specific attention to the hand and wrist areas. After the eleventh week, participants will have had the opportunity to focus on each ergonomic issue and each major body part independently. Finally, any specific issues of concern, such as lifting

Week	Topic
1	Overview
2	Posture
3	Force
4	Repetition
5	Soft-tissue Compression
6	Cold and Vibration
7	Duration and Recovery Time
8	Hands and Wrists
9	Shoulders and Elbows
10	Head and Neck
11	Back and Lower Body
12+	Special Issues

Figure 4. A training curriculum can be tailored to prepare observers to identify ergonomically-hazardous situations.

practices or keyboard entry, will be covered using the same approach.

Conclusions

A behavioral observation and feedback process can be a meaningful addition to the traditional tools and techniques used to manage ergonomic risks. It serves as a hazard identification and analysis tool, but unlike traditional methods, the observations conducted as part of the process occur frequently, with several brief observations taking place each day within a work area. In addition, the observation process serves as a hazard reduction tool by providing a structured mechanism to help employees use ergonomically-sound work practices – a need not met by the components of a traditional ergonomics program. To be most effective, however, employees conducting the observations must have a fairly extensive working knowledge of ergonomic risk factors in order to be able to identify them in their work environment. A "hands-on" training approach designed specifically for this purpose can prepare them well.

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