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Questioning Office Ergonomic Guidelines

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You've got a problem with office ergonomics. Or maybe you just want to prevent problems. You've attended a couple of ergonomics seminars, but you're not an ergonomist. What do you do? Many people turn to guidelines. But which ones?

That guideline you're considering might be based on outdated science, or it might not even apply to your jobs or people. Before you invest your company's money in new equipment or employee training, you need to ask some questions about those guidelines you're preparing to use.

This chapter will ask some of those questions and provide some examples of how guidelines can be misapplied.

1. DO THE AUTHORS KNOW WHAT THEY ARE TALKING ABOUT? DO THEY HAVE ANY HIDDEN AGENDAS?

Guideline makers run the gamut from individual ergonomists to government committees to companies selling ergonomic products. The quality of the guideline depends not only on the capabilities of the makers, but also on their goals.

Many, but not all, mass-produced, for-profit guideline publishers have to keep their customers in mind. Most often, the customer is the employer. Some publishers may fear that if they recommend ergonomic fixes that are too expensive, the employers won't buy their guidelines. Be careful if a guideline concentrates too much on changing the worker to fit the job, and not vice versa.

Local, state, national and international standards are usually developed by committees composed of many viewpoints: labor, employers, government, ergonomists, and suppliers of ergonomic products. Because of this, committee-built guidelines tend to represent the minimum recommendations that everyone can agree on, rather than the optimal level of practice. Check the introduction of the standard, where the minimum-optimum tradeoff may be elucidated.

Manufacturers of ergonomic products and trade and employee organizations often publish guidelines. They do this for many reasons, including limiting product liability, promoting products, public relations, and sometimes good ergonomics. Some of these guidelines are ghost-written by ergonomists, but others are put together by marketing or legal departments. If not done by ergonomics professionals, their recommendations are too often cobbled together from questionable published sources that aren't scrutinized and put into the right context. There also may be a tendency to emphasize solutions involving their own products. If you use guidelines from these sources, check the credentials of the authors, if you can.

Ergonomists are often involved in guideline writing on behalf of their own agendas, which may be the same as the ones described above. However, if the guideline is based on one actually used by the ergonomist in their own work, the results can be as good as the ergonomist is.

2. DOES IT EXPLAIN THE “WHYS” FOR THE RECOMMENDATIONS?

Try to figure out exactly what the recommendation is trying to accomplish. A guideline should explain the reasons behind its recommendations well enough so that you know when you should ignore or change them. A good rule is to never follow a guideline if you can't explain the principles behind it.

“Keep forearms parallel to the floor.”

The purpose for this recommendation is to ensure straight wrists. But keeping the forearms parallel to the floor results in straight wrists only if the keyboard is horizontal and at the same height as the elbows. Most guidelines don't include this qualifier. If keyboards are lower or higher than this (and there are some good reasons for lower keyboard heights, such as negative tilt keyboard trays), then the statement gives bad advice because it causes bent wrists.

“Keep the feet flat on the floor or on a foot rest.”

Although some people think that the feet should be flat on the floor at all times, the reason behind the recommendation is to avoid excessive pressure on the underside of the thighs, and to ensure that the user can use the floor for support when shifting postures. Because thigh pressure risks don't outweigh the ergonomic value of shifting posture frequently (a.k.a. fidgeting), the guideline should read “CAN the feet be placed flat on the floor or on a foot rest?”

3. DO THE TASKS HAVE ANYTHING TO DO WITH WHAT YOUR WORKERS DO?

Most office ergonomic guidelines don't tell you to what kind of jobs or tasks they apply, but if you look closely, it's often continuous data entry. They might work for your data entry jobs, but may not make sense for anyone else. For example, a fully articulating, height adjustable keyboard with all the bells and whistles will only get in the way of someone who uses their computer only to read bits of e-mail. Moreover, the high-risk task of handwriting is completely overlooked in computer-focused guidelines.

Different jobs truly require different solutions. Before instituting a change, decide what you want to accomplish. Sometimes what is appropriate for one task will make things worse for another.

4. DO THE DIMENSIONS IT RECOMMENDS FIT YOUR PEOPLE?

Unfortunately, most guidelines assume an average-sized group of workers.

“The seat depth should be 17 inches.”

Here's another instance where understanding the reasoning helps. An adequate seat depth both supports the thighs and allows the user to sit back far enough to use the backrest without creating pressure on the backs of the knees.

Here's a slightly extreme, but true, example. An Asian university needed to purchase chairs. They looked at several national standards and found almost universal agreement for a seat pan depth of 17 inches, which just happened to be the specification for most of the chair choices that were available. After the chairs were delivered, they discovered that almost none of their students could sit with their lower backs against the backrests.

Workstation dimension recommendations are often based on anthropometry, the study of body measurements. The custom is to design products to fit from the 5th percentile female dimensions to the 95th percentile male dimensions.

Many people assume that there exists a “fifth percentile female” and a correspondingly large male. However, such a person is unbelievably rare. For all dimensions on one person to be proportionately small (or large) involves a probability much less than 5 out of 100. That is because the percentiles refer to individual body segments, not standing height. If you look around, you will notice that people with long shins tend to have shorter thighs, and vice versa. Things even out. Therefore, while 5 out of 100 users will be too “long” or “short” for a “typical” seat depth, others will be all wrong for “typical” armrest heights, but fine for everything else.

Chris Grant, a Michigan office ergonomist, does an exercise in her workshops that gives an indication of how many people fall outside the 5th through 95th

percentile range in areas that affect computer workstations. She has attendees measure four body segments that are relevant to seating fit, plus standing height. About 50% of the participants fall outside the 5th percentile female - 95th percentile male range for at least one body dimension.

The implications here are important. To make sure more than about half (according to the Grant results) of your workers fit your chairs, you MUST have some workstations that are smaller, and some that are larger, than the fabled 5th-95th percentile. This means workstations that exceed ANSI (Human Factors Society, 1988) recommended adjustment ranges.

5. IS THE GUIDELINE BASED ON SCIENCE, OR JUST PREFERENCE?

Some guideline recommendations are based on preference, and some on science having to do with wear and tear, anthropometrics, or carefully measured discomfort. Preference data are often crude and can be influenced by equipment, habit and environmental factors. Sometimes preferences get confused with science.

One example is a study published in 1982, "Preferred VDT workstation settings, body posture and physical impairments," by Grandjean (Grandjean *et al.*, 1982). The researchers installed new, adjustable workstations and measured how they were adjusted. One finding was that the preferred viewing angle from the eyes to the center of the screen averaged 9 degrees below horizontal eye level.

In light of recent research that shows the benefits of lower monitor positions (see Ankrum and Nemeth, 1995 for a summary), the preference doesn't make sense. That is, until you look at a later publication of the same data, "VDT Workstation Design: Preferred Settings and Their Effect," (Grandjean *et al.*, 1983). With the new workstations, the complaints of strong, annoying screen reflections was reduced from 32% to 12%. The lighting was not optimised for VDT work and lower monitors would have resulted in even more glare on the screen.

In addition, to keep the screen at a right angle to the line of sight requires tipping it back one degree for every degree the center is below eye level. Because the monitors in the study could only tip back 10 degrees, a line-of-sight lower than 10 degrees to the center of the screen would have resulted in a condition with the top of the screen closer to the eyes than the bottom. That's uncomfortable and can increase eyestrain and postural discomfort (Ankrum *et al.* 1995).

Grandjean's recommended workstation settings have been cited repeatedly without an explanation of the limitations of the study.

A positive aspect of Grandjean's study was that it was done in a real life work environment, with real workers. Too often preferences are gathered from college students who have no experience in the area being surveyed.

6. ARE THE RECOMMENDATIONS OVERLY PRECISE?

"Keyboard heights should be adjustable from 27.7 to 33.5 inches."

There are no cliffs in ergonomics. One inch farther will not cause a fall to the death.

Translating from centimeters to inches can get ridiculous. For example, a 70-85 cm recommendation can be converted to 27.66-33.5 inches. That implies much more precision than the science supports.

The less familiar we are with the principles, the more precise we tend to be in following directions. Any time you see decimal places after a number, be suspicious.

7. DO YOUR WORKERS REBEL WHEN YOU TRY TO IMPLEMENT THE GUIDELINES?

“Maintain the ergonomically correct posture. See Figure 2.”

If you have to fight to get workers to follow the guidelines, then there might be something wrong with them. The guidelines, that is, not the workers.

Some guidelines include diagrams that dictate “proper” posture. “Figure 2” then shows a worker with every body angle at precisely 90 degrees. One guideline even insists that the toes must face forward.

Workers naturally rebel. They only assume the “ergonomically correct” posture when the posture police are in the area.

Many guidelines talk about a single posture as if workers shouldn’t move around, but the preponderance of ergonomic evidence supports plenty of movement ... postural variety. The variations in posture should generally be within a range, a certain distance from “neutral,” but even awkward postures can be desirable if they are voluntarily assumed and not sustained.

When workers balk at following suggestions, ask them why. Their reasons might make sense. The best behavioral changes are usually achieved by explaining the reasons for the guidelines and being flexible.

8. DOES IT WORK?

The ultimate criterion for judging a work environment is not how well it conforms to the guidelines. The bottom line is how well it facilitates the ability of the person to perform their work, effectively and without injury.

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