

Health Effects of VDTs

The promise of new office technologies is far-reaching, and offices everywhere are preparing for the automated future. But along with the benefits of any new technology come new questions and concerns. The challenge in the coming decade — when VDT use is expected to more than quadruple — will be to avoid any negative effects and maximize the potential benefits. To this end, VDT-related health concerns must be addressed.

In recent years, much attention has focused on health and safety in the automated office and hundreds of studies have been conducted throughout the U.S., Canada, Europe and Japan to investigate the complaints of VDT users. Several respected government research bodies have issued reports summarizing the many studies completed to date (see references). These reports verify what many office workers themselves have been saying: traditional health problems of office work may increase with VDT use. Fortunately, research has also found that health problems are largely preventable through a proper workstation and a well-designed job. These findings are summarized below.

Visual Difficulties

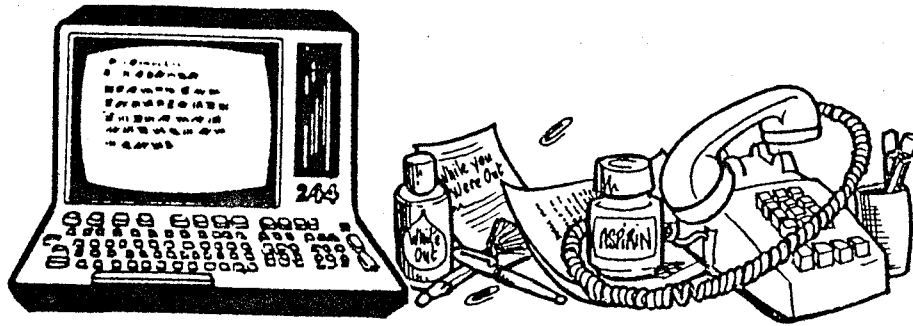
In the *National Institute of Occupational Safety and Health* (NIOSH) report summarizing research on VDTs the author notes,

studies indicate that VDT operators, as a group, suffer from a high incidence of visual disturbances, including visual fatigue, visual irritation, and headaches.

In addition, researchers have found that visual difficulty experienced by VDT users tends to persist longer than that of other office workers.

Why are VDTs harder on the eye? Researchers explain that the continuously refreshed images make difficult demands on the visual process, that glare contributes to visual stress, and that poor contrast often results from improper lighting and low quality glare screens. The video screen may also not be at a comfortable viewing distance, especially for eyeglass wearers. A member of the *National Research Council* (NRC) panel investigating VDTs summarizes, "I have never seen a VDT that was nearly as legible as the ordinary pieces of type-written paper or copied reports that circulate in our paper world."





Musculoskeletal Pain

NIOSH reports that,

most types of VDT work generally produce more muscular complaints than other types of traditional office work This is probably due to the increased postural demands imposed by the viewing requirements of the VDT. The musculoskeletal complaints are of a diverse nature, affecting the neck, shoulders, back, arms, hands and fingers, possibly demonstrating a systemic influence.

Muscle strain increases for VDT users largely because they must be positioned correctly for use of printed documents, the keyboard and the video screen; without proper furniture one of these is often at an improper height or distance. Also, VDT users sometimes work long, uninterrupted periods on the terminal; lack of movement strains muscles and causes fatigue, a condition called "static load."

A recent report for the federal *Office of Technology Assessment* (OTA) explains that musculoskeletal problems can result from both faulty equipment design and faulty job design.

One of the most consistent results of research on musculoskeletal problems has been the recognition of the importance of the type of task performed. Jobs which are highly repetitive and those involving constrained positions are associated with higher incidence rates of almost all musculoskeletal problems.



Stress

According to the OTA report,

A number of studies have clearly indicated that VDT tasks with certain characteristics are more stressful than both non-VDT and other types of work. The most frequently mentioned variables were monotony and boredom, monitoring, piecework, loss of control over work pace, technical problems or interruptions and production quotas.

VDTs change jobs in both planned and unplanned ways. For instance, supervisors' expectations are often shaped by vendor promises about the new equipment. The result may be unrealistic expectations and, thus, an unnecessary increase in user stress. These expectations, in some cases, are formalized into production quotas, where employees' keystrokes and errors are measured, and wages and promotions determined by their speed on the VDT.

The NRC states in its 1983 report,

VDTs, like any other work technology, can be used properly or improperly, and VDT work can be organized so that it reduces stress and increases productivity or increases stress and reduces productivity.

Of course, common office ailments — such as eye-strain, muscle pain, headache and stress — existed long before VDTs were introduced. The concern is that VDTs have increased the incidence of these health problems, though they can be largely prevented through a proper workstation and a well-designed job. One new concern has also arisen with the introduction of VDTs: that of a radiation hazard. Unlike the health problems discussed above, there is little agreement whether radiation presents a hazard to VDT users.

Radiation Hazard

In the last five years over twenty "clusters" of pregnancy problems among VDT users have been reported in the U.S. and Canada. Concern has focused on possible VDT emissions of two forms of radiation: ionizing and non-ionizing. *Food and Drug Administration* (FDA) studies in 1981 found some older VDT models in use between 1975 and 1980 emitted levels of ionizing radiation (x-rays) which exceeded protective standards for pregnant women. After this study, design modifications were made, and new models have not been found to exceed emission standards. Emissions also occurred in tests of seriously malfunctioning terminals; proper maintenance should prevent this hazard.

Non-ionizing radiation includes infrared, ultraviolet, and visible light, radiofrequency, and other forms.

Concern centers around two forms: very low frequency (VLF) and extra low frequency (ELF). Controversy exists among researchers: A 1984 *Congressional Research Service* White Paper on VDT hazards concluded it is "premature . . . to implicate non-ionizing radiation in VDT-related health disorders." Yet, a 1983 *Canadian Centre for Occupational Health and Safety* Study notes that non-ionizing radiation similar to that emitted by VDTs can damage blood cells and produce genetic damage. *The American Conference of Governmental Industrial Hygienists* recommends that, "All radiofrequency radiation exposures should be kept as low as reasonable given the current state of knowledge on human effects . . ." With so little known, many agree that more research is needed on effects of ELF and VLF emissions from VDTs.

The Good News: Prevention

Users, employers, and experts alike agree: health problems experienced by VDT users can be prevented through proper adjustment of the physical environment (office design) and the job itself (job content). The benefits of making improvements

can be far-reaching: better employee health and enhanced employee satisfaction (and thus lower absenteeism and turnover), increased productivity, reduced legal liability, and increased effectiveness of new office systems.

Office Design

Purchasing the VDT is only half the job; the other half is remodelling the work area so it is suited to VDT use. The diagram on page 5 points out many features of a VDT work area which may affect health. The guidelines in this diagram will help lessen many of the health problems which are related to VDT use. The user, of course, is the best judge of what feels comfortable, and this diagram should only serve as a guide. The key is adjustability.



Job Design

VDTs are part of an overall process of change resulting from automation. Automation not only changes the way offices look and sound, it changes the content of office workers' jobs. Even a model VDT workstation will not prevent health problems if automated jobs become more stressful.

Practices such as the following help ensure that job quality does not decline when VDTs are used:

- rest breaks every two hours for general VDT work or every hour for more demanding VDT work;
- a limit of four hours work on the VDT each workday;
- retention of jobs with varied duties;
- thorough employee training to allow for confident, efficient use of new equipment;
- supervisor education so they have reasonable expectations of VDT users;
- updated job descriptions and wage increases for those using additional skills on automated equipment
- avoidance of individual monitoring of work performance;
- sufficient equipment to meet the needs of the office.

In the longterm, reducing stress through these practices can lead to many cost-saving benefits: higher productivity and lower turnover and absenteeism.

Prevention cont.

Radiation

It is unknown whether there is a VDT radiation hazard. Yet given the uncertainty, it is advisable to err on the safe side and take reasonable precautions. The following practices would reduce any existing hazard:

- regularly service terminals to prevent any unusual emissions resulting from malfunction;
- design jobs so employees are not required to sit in front of a VDT all day long;
- enable pregnant women to transfer to a non-VDT job with no loss of pay, if they choose;
- only purchase equipment which has been factory tested for radiation emissions;
- consider screening to reduce emissions of non-ionizing radiation.

References

- Arndt, Robert and Larry Chapman, *Potential Office Hazards and Controls*, Washington, D.C.: Office of Technology Assessment, U.S. Congress, 1983.
- Bureau of Radiological Health, Food and Drug Administration. *An Evaluation of Radiation Emission from Video Display Terminals*. DHHS-FDA Publication No. 81-8153. Rockville, Md: U.S. Department of Health and Human Services, February 1981.
- Marha, Karel, et al. *The Case for Concern about Very Low Frequency Fields from Visual Display Terminals: The Need for Further Research and Shielding of VDTs*. Hamilton, Ontario: Canadian Centre for Occupational Health and Safety, April 22, 1983.
- Dodge, Christopher H., *Video Display Terminals: The Controversy about Health and Safety Issues*. Washington, D.C.: Congressional Research Service, The Library of Congress, January 6, 1984.
- National Research Council, *Video Displays, Work and Vision*. Washington, D.C.: National Academy Press, 1983.
- Smith, Michael J., *Health Issues in VDT Work*. Washington, D.C.: National Institute for Occupational Safety and Health, 1983.
- TLVs Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1982*. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists, 1982.

VDT Checklist

VDT Workstation

Does the VDT have:

- a detached keyboard
 - non-glare glass (or an effective glare shield)
 - brightness and contrast controls
 - adjustable tilt
 - adjustable height
 - characters which are large and sharp enough to read easily
 - no visible flicker
-
- Is the VDT quiet, that is, no annoying or high pitched humming?
 - Is the VDT regularly cleaned and serviced?
 - Has the VDT manufacturer provided information about radiation levels measured during factory testing?

Does the desk have:

- a lower, adjustable surface for the keyboard and a higher surface for the screen
 - enough space for the materials worked with
 - enough space so the screen is at a comfortable viewing distance (1-2 ft.)
 - a non-glare finish
-
- Is a copy holder available?

- Is the chair easily adjustable for height and back support?
- Have the overhead lights been dimmed and a desk lamp provided?
- Do the windows have blinds or curtains?
- Are noisy printers in a separate area? If not, are they covered with noise shields?

Job Design

- May users take rest breaks every hour from intensive VDT work?
- Do jobs require a variety of duties on and off the VDT?
- Most days, may VDT users keep the number of hours at the VDT under four?
- Do users receive thorough training on the VDT?
- Do job descriptions accurately reflect the work done on VDTs?
- Is there enough VDT equipment to meet the needs of the whole office?
- Are users asked to participate in decisions about how new systems will be implemented?
- May users choose not to work on a VDT during pregnancy without loss of pay or job seniority?