

VDTs THE EUROPEAN EXPERIENCE

BY JANET RALOFF

European research suggests VDT's are not as benign as their promoters had claimed

The computer revolution is making a man-machine dialogue virtually unavoidable for most Americans. Increasingly, this interplay of human and machine intelligence occurs via the console of a video-display terminal — the VDT. But this particular mode of communication has caused a rash of headaches among users. Researchers here and abroad are asking why. And to date, most data — hence clues — have emerged from European investigations.

Many of those leading such probes convened at the National Academy of Sciences in Washington one week ago for a symposium on VDT's and the vision of workers. Conducted under the aegis of the National Research Council's Committee on Vision, it was part of a study being performed for the National Institute for Occupational Safety and Health (NIOSH).

What the two-day meeting makes clear is that there is an epidemic of visual fatigue plaguing VDT-users — particularly clerical workers — and at least the suggestion of possibly more serious and lasting physiological hazards. Complaints have traditionally run the gamut of standard fatigue symptoms — from eyestrain and pain in the head, neck, back, shoulders or hands, to boredom, lethargy and lack of self-esteem. Yet depending on the sophistication of the unit, a VDT console may be no more than an ordinary cathode-ray tube, identical to the television screen illuminating most American homes nightly. Why are TV viewers comfortable and ostensibly relaxed by video viewing while VDT workers are apparently undergoing notable stress? And do workers with functions similar to those of VDT users experience similar symptoms? Preliminary investigations have not answered any of these questions definitively.

Research results presented in Washington by Etienne Grandjean of the Swiss Federal Institute of Technology last week did, however, show a statistical correlation between the clarity and quality of letters printed on eight different VDT screens and reports of eye pain and blurred vision. Complaints were demonstrably higher where VDT-screen characters were unstable (wiggled), flickered, lacked crisp definition and provided less space inside letters — such as O's and R's — to aid their recognition.

Grandjean's experiments, which used photodetector oscilloscopes and other measuring devices, showed that even new VDT screens did not necessarily meet manufacturer's claims. And two screens with the same average luminosity — 40 candela per square meter — were demonstrated to achieve it differently, suggesting why one may be less desirable: One produced a sharp peak in luminance (700 cd/m²) that fell off immediately, eventually

reaching near blackness before the screen's characters were "refreshed"; the other tended to maintain a more nearly constant luminosity of 70 cd/m², refreshing long before characters went black.

According to Marvin Dainoff of NIOSH, who has published one of the most extensive surveys of VDT-related eye problems, this was "the most important paper presented." Grandjean physically quantified differences between "good" and "bad" screens — those with neat versus sloppy characters, flickering versus stable letters — and then correlated those qualities with complaints of visual problems. "Now that may sound like a small thing, but it is the first time that anyone has done that," Dainoff told SCIENCE NEWS.

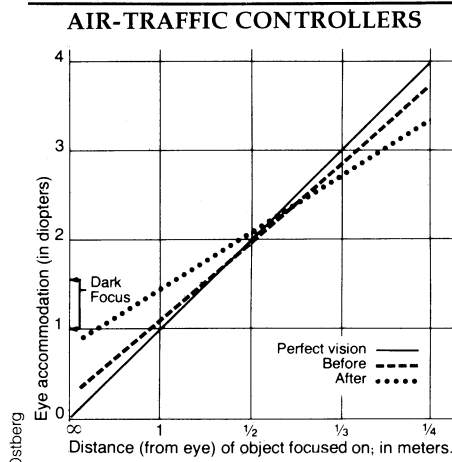
Olov Östberg, senior staff environmental officer for the Central Organization of Salaried Employees — a consortium of roughly 20 Swedish unions — reported on studies he conducted using a laser op-

tometer. With it he measured how well eyes of air-traffic controllers could "accommodate" (adjust their lenses to focus) — both before and after individuals worked for two continuous hours at their radar's VDT screen. Results showed, he told SCIENCE NEWS in an interview, that the eyes' lenses were flexible, if a bit lazy, before the work session. Afterward, "this laziness became more pronounced" — accommodating 1/2 diopter too little when focusing on near objects, 1/2 diopter too much for distant objects (see graph).

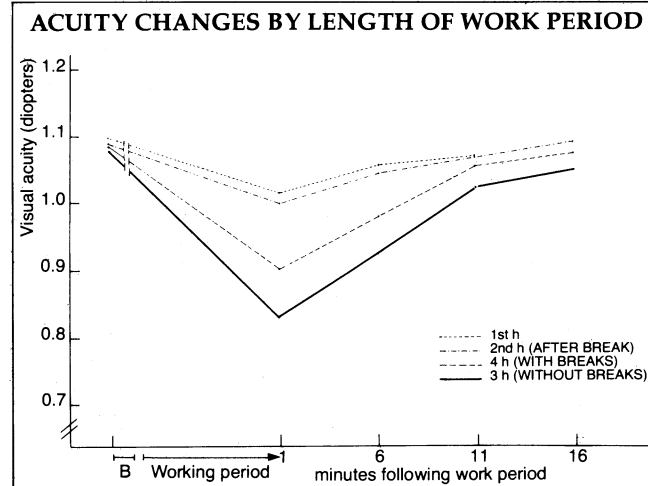
While changes were temporary — eyes returned to normal after a 30-minute lunch break — they demonstrate fatigue, Östberg says. Perhaps more important, changes in eye accommodation translate to changes in depth perception, he explains, and could cause problems if flight-controllers move from VDT work to observational guidance from a flight-control tower at night — something he observed the Swedish controllers to do. He recommends that air-controllers unions investigate this further and work toward ensuring that workers get mandatory rest breaks for the eyes if they spend more than two hours at a VDT.

Östberg says an ongoing study of clerical Swedish telecommunications employees shows similar eye-accommodation problems — what amounts to temporary myopia, or near-sightedness — after two hours of VDT work, although the magnitude changes are not as great as were found in the flight controllers. Workers doing similar office functions without VDT's showed no such changes, he says.

Manfred Haider at the University of Vienna noted not only temporary myopia, but also color-contingent after effects, among the small group of VDT operators he studied. All used consoles with colored displays — either yellow or green. In one study, 14 skilled operators worked continuously for two hours, or for four hours with rest breaks. In another, 13 worked



After focusing on radar-display screens, the eyes of air-traffic controllers developed a temporary 1/2 diopter change in their ability to focus both close and distant objects. A diopter is defined as 1/focal length (measured in meters); therefore 1 diopter equals 1 meter.



Results for work on different VDT's with green characters. Temporary myopization — of about 1/4 diopter magnitude — is apparent in the group working for four hours, even though work breaks were included. Those working without a break for 3 continuous hours show strongest effects.

Haider et al

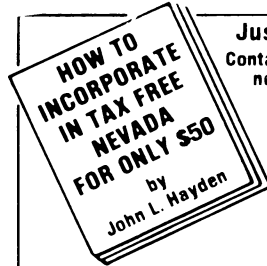


...VDTs

four 3-hour stints at a VDT. Wall-chart visual-acuity tests were given before and after each session with other measures gauging changes in color perception. Average acuity for all was 20:18 prior to video viewing. Afterward, all groups had declined in acuity and become sleepy, with those in the 3-hour no-break sessions faring worst: acuity drops to 20:22 with yellow screens, drops to 20:25 with green. Normal acuity returned in 16 minutes. Clerical workers with similar tasks but no VDT's showed no acuity change. Altered color perception lasted only several minutes among the tested operators, though there have been reports of it lasting hours or even days, Haider says.

Finally, the Swedish team of Gunn Johansson and Gunnar Aronsson published results of a study last year noting higher after-work catecholamine levels (which might be viewed as a physiological indicator of stress) among VDT users. Triglyceride levels — a risk factor in heart disease — were also higher among the 95 VDT operators studied than in the controls during standard health exams.

These European investigators emphasize that their findings are tentative. They are also controversial, and have often been greeted by Americans with a generous measure of skepticism. Despite their shortcomings, Dainoff says European studies still offer the best gauge of what VDT operators are experiencing.



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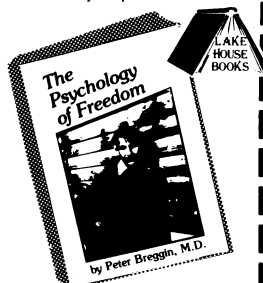
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