SCIENCE NEWS®

The Weekly Newsmagazine of Science

A Science Service Publication
Volume 134, No. 21, November 19, 1988

Subscription Department
231 West Center Street, Marion, Ohio 43305

Subscription rate: 1 yr., $34.50; 2 yrs., $58.00. (Foreign postage $6.00 additional per year.) Change of address: Four to six weeks' notice is required. Please state exactly how magazine is to be addressed. Include zip code. For new subscriptions only call **(1) 800-247-2160.** Printed in U.S.A. Second class postage paid at Washington, D.C., and additional mailing offices. Title registered as trademark U.S. and Canadian Patent Offices. Published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington, D.C. 20036. (202-785-2255)
ISSN 0036-8423

This Week

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VDT effects: Three views

As a vision specialist who has concentrated on visually related VDT problems, I read with intense professional interest "VDTs on Trial" (SN: 9/10/88, p. 174).

It seems that every article written about VDT problems in the past five to 10 years states that the most common complaints are vision disorders. And yet every author seems to suggest that the answers to these problems are installing antiglare filters, resting eyes and avoiding the use of VDTs as much as possible, coupled with the use of ergonomically proper furniture.

Rarely does the author address the visual problem directly. My clinical experience and research in the area suggest to me very strongly that other than visual acuity, which is easily tested, the two probable culprits in VDT visual discomfort are muscle problems called esophoria and/or hyperphoria. Esophoria is a condition in which the two eyes overconverge when looking at an object. Hyperphoria is a condition in which one eye sees an object higher (or lower) than the other eye. Because vision is a binocular function, when two eyes do not work precisely as a team there is visual stress.

Happily, either difficulty can be easily detected with a good visual exam or screening program, and they can be corrected if the doctor is alert to them.

Melvin Schrier
New York, N.Y.

As one can deduce from the interview quotes in "VDTs on Trial," powerful interests such as those represented by Charlotte LeGates are in the same position as tobacco manufacturers who refuse to admit that cigarette smoking is harmful, while tunnel-vision specialists like Mr. Edelson muddy the waters by insisting that "Chairs *are* the problem" and proposing that VDT users walk while typing — a suggestion worthy of Lewis Carroll's Queen of Hearts.

The real issue is biochemical. We have been able to show objectively by bioassay and animal tests that extremely weak electric and/or magnetic fields at certain frequencies, rectified by organic dielectrics in the body, can generate a bias to the membrane potential — and thus alter the metabolism -- of cells involved in the complex orchestration of the biochemical system. This exogenic stress, over a long period of months, initiates a variety of reversible "video operator's distress syndrome" (VODS) symptoms, and during the first trimester the resulting biochemical shifts might irreversibly influence embryonic development and gestation.

That's the major part of the VODS problem with people using VDTs more than 20 hours a week, and not giving their autonomic system time to recover from these very slight but cumulative biochemical effects. But the solution is simple. A grounded, electrically conductive filter over the VDT screen is all that's needed to protect the user against troublesome nonionizing radiation.

Author Melissa Hendricks points out quite accurately that electric and magnetic fields radiated by VDTs are well below all existing

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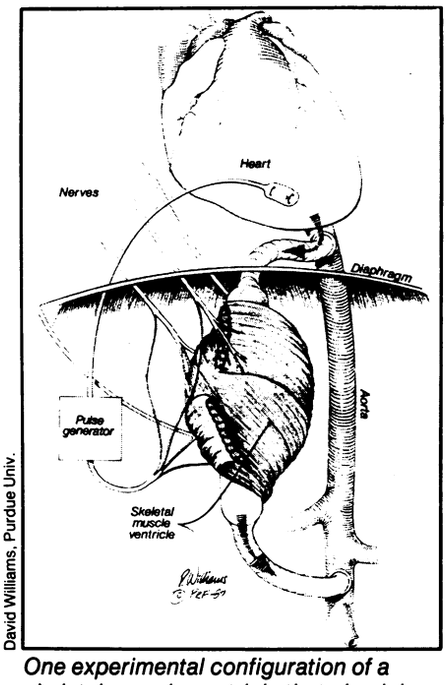
improvement results from the technique, say Chachques and Magovern, in part because surgeons often treat other cardiac problems in the same operation. Moreover, since the procedure is offered only to the most severely ill patients, the short-term mortality rate of about 50 percent does not necessarily indicate its potential value in healthier patients. But as measured by such indicators as total cardiac output and hospitalization rate before and after surgery, the procedure seems promising, researchers say.

"On average, I'd say we're seeing about a 20 percent improvement in the cardiac output," Magovern says. "And 20 percent can mean the difference between being almost an invalid and resuming a fairly normal life."

Those figures may improve. he adds, with an advanced pacemaker available in France but still awaiting U.S. approval by the Food and Drug Administration (FDA). Magovern, chairman of surgery at Allegheny General Hospital in Pittsburgh, has asked the FDA for permission to use the experimental device on 10 patients and expects a reply "momentarily."



David Williams, Purdue Univ.

One experimental configuration of a skeletal-muscle ventricle that physicians may someday implant as a heart assist.

Researchers experimenting with skeletal-muscle ventricles, or SMVs, face many of the same problems their heart-wrap colleagues do, and a few more. Their approach to cardiac assistance is to add to the body's circulatory system some biocompatible tubing and one or two synthetic balloons. They generally splice this extra bit of plumbing into the aorta—the large artery through which oxygenated blood leaves the left ventricle on its way to the rest of the body. They wrap skeletal muscle around the balloon(s) and wire the muscle to contract in synchrony with the heart.

In these systems, depending on the specific design, it's often more helpful for the balloon pump to contract while the heart is "resting" between beats. And in one experimental version of this "extra-aortic balloon," described at the conference by Garrett Walsh of the Montreal General Hospital, surgeons place the balloon under the intact latissimus dorsi, bringing the balloon to the muscle instead of vice versa.

In most SMVs, however, scientists have trouble preventing clot formation. Blood pooling within the oddly routed system—and contact between the artificial materials and the blood — often results in multiple clots that can block crucial vessels and lead to death.

So, while researchers express pleasure about the blood pressures that balloon pumps can generate in dogs and other animals, "we don't believe at this point that a skeletal-muscle ventricle is anywhere near clinical application," Magovern says. Adds Walsh: "In some respects it's the Wright Brothers stage."

Whichever way skeletal muscle eventually supports cardiac function, pacemaker technology will prove critical to its success. New research demonstrates that single bursts of electricity — those typically delivered by FDA-approved pacemakers—do a poor job of getting skeletal muscle to contract. A burst of about eight jolts in extremely rapid succession seems to get the best contraction. The device used by Chachques and sought by Magovern delivers such a burst, but even better technology is on the horizon.

A new stimulator, expected to be available in Europe soon, is totally programmable, say researchers. By manipulating voltage levels, burst frequencies and other parameters, the device should help researchers determine the ideal "training schedule" for getting skeletal muscle to behave more like cardiac muscle. Today, concedes Badylak, "I don't think we're anywhere near knowing what the optimum stimulation parameters are."

But with improved knowledge about how to condition skeletal muscle for cardiac duty, and with a programmed pacemaker capable of handling a large number of contingencies, the future of cardiac assistance with skeletal muscle looks bright, concludes Ray Chu-Jeng Chiu of Montreal General Hospital. Ideally, he says, a stimulator would fire just frequently enough to keep the muscle conditioned, and would kick in fully only when blood pressure drops, indicating the heart's inability to handle its workload. The upcoming model should stop firing if it senses very unusual cardiac rhythms, to ensure it doesn't exacerbate the arrhythmia. And perhaps someday, Chiu says, a stimulator will deliver strong, defibrillating shocks when necessary to restore a normal rhythm.

"If we get that," he says, "it'll be like having a little cardiologist sitting inside the patient." □

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government and industrial radiation-safety standards. This statement, although impressive and a very useful shield behind which industry may hide, is irrelevant to the case because all existing safety standards have been based on the field intensities at which *cell damage occurs*. In developing these "standards," no consideration has yet been given to those far lower intensities that cannot damage cells but merely shift their energy level and metabolic cycle.

It is my observation that VDT manufacturers are quietly beginning to clean up their act, and eventually harmless plasma displays will probably replace cathode ray tubes. But what about the tens of millions of radiating VDTs that are out there and will continue to be used for many years to come?

Charles Wallach
President, Behavioral Research Associates
Canoga Park, Calif.

For a couple years now, I've been reading articles on VDT hazards looking for reports on two forms of radiation that I've never seen discussed. Your article got close to one. It mentioned a "sawtooth-shaped wave," presumably from the magnetic coils that deflect the electron beam that paints the screen. While I can find that on my terminal with an oscilloscope probe, I can find a much stronger spike waveform near the flyback transformer in the high-voltage section. By placing a bare oscilloscope probe by my terminal's side near the flyback transformer, I measure a 0.4-volt spike. This the most conservative measurement I can do; if I use my hand as the antenna and touch the probe tip with my other, I get more than 4 volts. Another display I own radiates so much I can't put it on top of data cables because the signal couples into the wires and causes data errors.

The flyback transformer is also the source of a form of radiation I've never read about in the press, audible radiation. Each pulse in the transformer makes its shape pulse slightly, causing a sound wave. The frequency is generally 15 to 20 kilohertz, a range that many people can hear. One VDT I had in my office was so loud I would get a headache if I used it for 15 minutes. Since researchers can't confidently blame electromagnetic radiation for problems, I think they need to study every possibility.

Finally, I've noticed that the studies seem to focus on people who use VDTs for all their work. Within the software engineering community, I've heard very few complaints about VDTs. While we can spend 50 to 75 percent of our workday using them, we also move around, go to meetings and read SCIENCE NEWS. Therefore, I am pleased to see that researchers are becoming less concerned about the electromagnetic radiation and more concerned about job requirements and ergonomics.

Eric Werme
Amherst, N.H.