



DALLAS--Like mechanics checking for telltale engine "knocks," medical scientists here are listening to revved-up human hearts in exercise experiments designed to help paunchy middle-aged men avoid--or at least survive--fatal heart attacks.

Doctors at The University of Texas (Southwestern) Medical School at Dallas are using such tools as the phonocardiogram, a supersensitive device that records delicate heart sounds, and other sophisticated gadgetry to monitor the changing physical state of some 100 sedentary males currently sweating off their flab by jogging and pedaling at the Downtown YMCA.

UTSMS researchers are interested in the sedentary middle-aged males, explains Dr. Stuart A. Bergman, postdoctoral research fellow conducting the studies, because "these are frequently the humans who are most vulnerable to a heart attack."

Dr. Bergman discovered a classic case of poor heart conditioning among the first volunteers tested as part of the "Y" program:

The man, a 34-year-old government clerk, works entirely behind a desk. His only exercise is walking to his parked car. At home, he's also chair-bound--watching TV. He does no yardwork, doesn't walk a dog. In school he played in the band and never took part in athletics.

In a pre-exercise examination, the man showed a high and erratic pulse rate while resting of 80 to 100 beats per minute (an athlete's heart beats steadily at about 50). A moderate level of bike-pedaling sent his heart pounding to 150.

On a "tilt" bed slanted on circular rockers at a 70-degree angle, the young man turned pale and became dizzy. His pulse climbed to 120, and his blood pressure dropped--even though he was inert. These responses indicated, among other things, poor return of blood to the heart through the veins and poor blood-vessel tone, Dr. Bergman noted.

"Obviously," he said, "this man's ability to withstand any stress to his heart was dangerously low."

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first add exercise

But with slowly accelerating exercise, the young man began to show an increase in the ability of his sluggish heart to pump blood. And already he is feeling better--physically and psychologically--as a result of the training, Dr. Bergman reported.

By studying physical changes in these volunteers, the UTSMS researchers hope to learn how exercise increases the heart's efficiency and strengthens its ability to withstand stress--such as a heart attack.

One dividend from the study, said the 30-year-old Dr. Bergman, could be a formula indicating "the amount of exercise the normal person must do each week to insure this protection for his heart."

The exercisers report regularly to the medical school's Pauline and Adolph Weinberger Laboratory for Cardiopulmonary Research for tests before, during and at the end of their year-long series of workouts. While they pedal a stationary bicycle, sensors record vital signs such as heartbeat, pulse and the rate of oxygen utilization or "uptake"--a key index of conditioning.

Dr. Bergman and his associates are counting on the phonocardiogram and other newly developed techniques to give them a clearer picture of what takes place within the heart, lungs and blood vessels.

"We are particularly interested in how a heart has maladapted to life behind a desk and how we can reverse this maladaptation," he said.

Already, early phocardiogram testing indicates that some heart sounds previously defined as being related to disease may in fact occur in normal hearts during exercise, Dr. Bergman said.

These include extra "beats" in addition to the well known "lub-dub" sounds normal hearts make during its rhythmic cycle, he explained. Some "little murmurs" during exercise also have been observed in normal persons.

The phocardiogram provides an analysis of the sounds made by the beating heart, blood vessels and blood in motion, measuring mechanical rather than electrical activity. "This should enable us to evaluate the efficiency of the heart as a pump," he said.

A heart with normal electrical activity, as picked up by a resting electrocardiogram, can in fact have undetected disease, Dr. Bergman pointed out.

The phonocardiogram is more sensitive than the doctor's old standby, the stethoscope. And a permanent record of its soundings is made that can be analyzed by computer techniques.

second add exercise

Another device, the mass spectrometer, instantly measures the rate of oxygen "uptake" and the amount of blood pumped by the heart, by analyzing exhaled air--without cumbersome older techniques, some requiring minor surgery.

The immediate goal of the YMCA exercise program is to arrive at the state of dynamic body function in which all organs work efficiently, Dr. Bergman said.

"This means," he said, "that the heart, blood vessels and lungs perform their functions of delivering oxygen and foodstuffs to, and carry wastes away from, all the body tissues with little wasted effort."

A sedentary person's heart, blood vessels and lungs are inefficient in this regard, both at rest and under stress, he said. The ramifications can be ominous.

"Should hidden cardiovascular disease be present and this person attempt to meet a stress situation all of a sudden--well, you've heard of persons having heart attacks while trying to shovel away the first snow or while climbing hills during a deer hunt. These events are all too common.

"The process of exercise, by temporarily elevating heart and lung action, increases the capacity of the heart and blood vessels to pump a greater blood supply to the body and strengthens the cardiovascular and respiratory systems.

"This in turn gives the person a reserve power that can be called upon to meet stressful situations," he said.

"If the stressful event happens to be a heart attack due to hidden coronary disease, then the more efficient pump can handle even this situation long enough for the repair process to restore good function."

Men who are generally inactive may already have some damage to the heart, he said.

"Autopsies on sedentary persons who die from accidents have shown that in many cases little infarcts (death of muscle tissue) have already occurred.

But exercise is no cureall, Dr. Bergman cautioned. It cannot erase adverse factors such as diabetes, high blood pressure or high fat content of blood which leads to atherosclerosis--clogging of blood vessels by fatty deposits, the cause of most middle-aged heart problems.

Fatty deposits of cholesterol are found in almost all males over 45, regardless of conditioning, Dr. Bergman pointed out. But exercise may help the heart "revascularize," developing alternate blood pathways and thus partially overcome the effect of localized narrowing of coronary arteries by these deposits.

third add exercise

Dr. Bergman said the maximal heart rate--the largest number of contractions possible per minute--does not change with conditioning. "The change that does occur is in the increased amount of blood pumped with each beat and the amount of oxygen delivered to the exercising muscles."

This oxygen factor has been established in previous widely-recognized research at UTSMS as a principal indicator of physical fitness. The earlier studies relating oxygen "uptake" to cardiovascular and pulmonary function were conducted by Dr. Jere H. Mitchell, director of the Weinberger laboratory.

Dr. Mitchell, with Dr. Gunnar Blomqvist, is supervising the current exercise research, financed by a National Aeronautics and Space Administration grant.

NASA is interested in symptoms similar to those shown by the sedentary clerk on the "tilt" bed, Dr. Bergman said. Astronauts become deconditioned during long space flights, and some have fainted soon after returning to the earth's gravity after being in a weightless state.

"It is hoped that the Dallas studies will shed new light on this problem," he said.

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