

CAN EXERCISE MAKE YOU SMARTER?

Scientists are probing the links between physical activity and brain power.

by Carol Krucoff

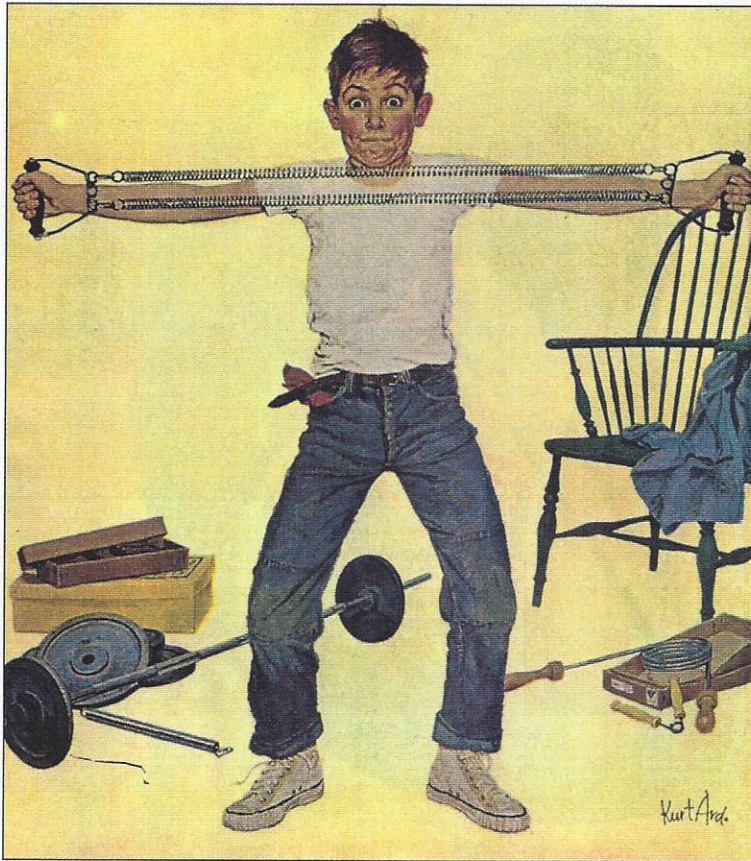
Just as exercise strengthens the heart and lungs, bones and muscles, it may also power up the brain. A growing body of research in animals suggests that physical activity might have a positive effect on mental functioning.

"It's clear that the brain benefits from exercise," says neuroscientist William Greenough of the University of Illinois at Champaign-Urbana. His studies with rats have demonstrated two major effects of activity: Aerobic exercise fuels the brain with more nutrients, and skill-based exercise increases the number of synapses, or connections, which, some scientists theorize, may make the brain better able to process information.

In one experiment, rats were separated into three groups. One group exercised on an automated treadmill, a second group honed their skills in an acrobatic, "boot camp"-style obstacle course, and a third group was sedentary.

"The acrobatic animals that learned [in the "boot camp" group] showed a greater number of synapses than the animals in the exercise or inactive groups," Greenough said. "In contrast, the animals that exercised [on the treadmill] had a greater density of blood vessels in the brain than did either the acrobatic or inactive animals."

Learning a new dance step may boost the brain in the same way that learning a language can, he says. And if the dance is aerobic as well, the benefits double. Young brains may be especially able to boost brain power through exercise, suggested another of Greenough's



New research suggests that the brain clearly benefits from physical activity. The young may be especially able to boost brain power through exercise.

experiments that showed the most significant changes in the brain occurred among rats that exercised just after weaning. And while animals aren't people, he says the same effect found in rats may apply to humans.

Human studies have focused primarily on older adults and suggest that regular exercise can improve the speed with which the brain processes information. Research by psychologist Arthur Kramer at the University of Illinois demonstrated that sedentary adults, aged 63 to 82, could hit buttons faster in response to a tone after they went through a 10-week water aerobics course. A control group that didn't exercise showed no improvement.

This boost in reaction time after ex-

ercise training may occur because declines associated with aging could actually stem from declines in fitness. Some scientists speculate that reduced mental functioning often attributed to aging may be the result of a sedentary lifestyle and related factors such as medications and poor nutrition.

"In older people, an exercise regime appears important for brain maintenance," says Daniel M. Landers, professor of exercise science at Arizona State University, who recently published an article reviewing the literature on activity's effect on the brain.

Numerous studies show that children who engage in regular physical activity do better in school than their sedentary classmates. But until recently, the academic edge conferred by sports participation was thought to come from the increased self-confidence, better mood, and the ability to concentrate that come from burning off steam in exercise. Now, however, some scientists point to possible physiological connections.

Pierce J. Howard, a Charlotte, North Carolina-based organizational psychologist and author of *The Owner's Manual for the Brain*, says new research indicates that aerobic exercise increases the amount of certain brain chemicals that stimulate growth of nerve cells.

Inactivity may also have detrimental effects on mind and body alike. "Cognitive scientists recognize that mind is body, and body is mind," Howard notes. The most beneficial forms of exercise, he says, engage both. ▲