

23



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TABLE OF
CONTENTS

CONTENTS BY
TOPIC

COLUMNS

REGULAR
FEATURES

SCIENCE AND TECHNOLOGY

Juiced on the Job

PERFORMANCE-ENHANCING DRUGS ARE CREEPING INTO THE WHITE-COLLAR WORKPLACE. NEW ONES MAY PROMISE TO PUT YOUR BRAIN ON STEROIDS.

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Performance-enhancing drugs have had a huge impact on sports ever since muscle-bound East German women astounded their rivals in the 1972 and 1976 Olympics. Their record-setting victories led to athletes' covertly competing in the laboratory for drugs that would give them an advantage in the field. Amid periodic steroid scandals, Congress has held multiple hearings, numerous athletes have been stripped of their medals, and most major sports associations have discarded traditional notions of privacy to test athletes for banned drugs.

But performance-boosting drugs aren't a problem only for sports. They're heading toward a much larger and more familiar area of competition--the white-collar workplace.

A variety of studies, polls, and anecdotal evidence show that increasing numbers of professionals and students are using various drugs to sharpen their attention at work or school, reduce their sleep time, or calm their nerves. Parents are even providing drugs to help their kids win admission to college. A survey of readers conducted by *Nature*, a United Kingdom-based science journal, showed that about 20 percent of 1,400 international respondents said they had taken such drugs to improve workplace performance. Those polled were scientists and academics, most of whom spend their days and nights in an intensely competitive race to discover, publicize, and patent new drugs or technologies. Sixty-nine percent of the respondents said they would take "neuro-enhancer" drugs that cause mild side effects, and one-third said they would feel pressure to give drugs to their children if rival high school students were using them.

Caffeine has an iconic role as a pick-me-up for tired workers (and is often provided free by employers), and alcohol has helped seal myriad business deals. But novel drugs emerging from the nation's laboratories are finding their way into the workplace. They include concentration boosters such as Ritalin and Adderall, beta-blockers that calm nerves, and sleep suppressors such as modafinil (marketed as Provigil).

Two years ago, Medco Health Solutions, a pharmacy firm, reported that the number of prescriptions for working-age adults diagnosed with attention deficit disorder had doubled in four years. The drugs prescribed, such as Adderall and Ritalin, tend to boost concentration, and they are often called "cognitive-enhancement" drugs. In 2006, 1.2 percent of people ages 20 to 44 were taking the drugs, up from 0.6 percent in 2001. By 2006, the number of women taking them was equal to the number of men, even though far more schoolboys are diagnosed with the problem than schoolgirls.

This emergence of "adult ADHD" has been accompanied by increased advocacy among mental health professionals. In May 2008, for example, the journal *Occupational and Environmental Medicine* published a study saying that 4.5 percent of U.S. workers have attention deficit/hyperactivity disorder and that it reduces their productivity by 28.3 days per year.

Industry advocates say that researchers will soon deliver more drugs capable of goosing workers' performance, and that the improvement will be enough to make a real difference to company profits and workers' pay. Industry lobbyists are seeking hundreds of millions of dollars for research that will accelerate these developments, and millions of dollars to win public acceptance for brain-boosting drugs.

Many of these emerging cognitive-enhancement drugs will stem from research into destructive diseases, such

as schizophrenia and Alzheimer's. There is plenty of public support for this research, boosted lately by calls to help war veterans with brain injuries and stress disorders.

These newer drugs may lack side effects, making them more tempting for both workers and employers. If they help our memory, focus our attention, and calm us under pressure, workers eager to earn a bonus or desperate to avoid a pink slip will likely ignore the prescriptions that limit the drugs' use to specific medical conditions. And it won't be easy for peers or government officials to discern whether the drugs, their uses, and the distribution networks that provide them are legal or illegal.

The nascent brain-drug industry is showcasing the potential benefits of its emerging technology, and it isn't shy about predicting the likely impact on a global economy. "If you're GE Capital and you have offices in 154 financial centers around the planet, and these [brain-drug] tools are available in Dubai, and your workers there are trading more effectively, 5 to 10 percent better--they'll have a neuro-competitive advantage over workers where these tools are not legalized," said Zack Lynch, founder and executive director of the Neurotechnology Industry Organization. Even with such modest gains, "companies will shift their work offshore" if performance-boosting drugs are restricted in the United States, he said.

This year, Lynch's San Francisco-based group is stepping up a lobbying campaign to pass a National Neurotechnology Initiative bill that would encourage federal agencies to spend an additional \$800 million to accelerate the development and approval of brain-related research over the next four years.

Unless regulators can draw some bright lines, some companies will first nudge and then pressure their workers to take these drugs, said Nigel Cameron, director of the Center on Nanotechnology and Society and a bioethics professor at the Chicago-Kent College of Law. Eventually, advocates will portray disputes over drug-taking as the reason to create "a federal drug-care program of endless mind-bending opportunities so that everyone can have the illusion they are doing better than they really are," he said.

At the moment, there's a dearth of reliable data on workplace drug use. But health officials are reading the studies and polls that are available, talking to colleagues and students, and calling for more and larger studies of drug use in the workplace. "Let's find out; let's get some answers," said Nora Volkow, director of the National Institute on Drug Abuse at the National Institutes of Health.

Enhancing Performance

Truck drivers take drugs to stay awake, miners take them to lessen pain, and factory workers take them to keep pace on the assembly line. Usually, these are illegally obtained versions of medications intended for other purposes, and their abuse can harm the users. They also contribute to accidents, such as freeway collisions and train crashes. Federal agencies, including the Transportation Department and the Occupational Safety and Health Administration, oversee such drug-related safety issues.

In sports, doping has become prevalent because the workers--batters, runners, swimmers, quarterbacks--believe they can gain advantages over their peers that lead to big payoffs in prestige and money. This doping includes both muscle-building drugs, such as steroids and human growth hormone, and stimulants intended to increase concentration and shorten reaction times. The efforts of employers and sports organizations, such as the International Olympic Committee, to curb athletes' drug use often fall short.

These attempts at control, however, are not prompted by corporate fears of accidents or reduced worker productivity but by their customers' desire to see fellow humans compete on a level playing field, unaided by advantages of birth and rank, by drugs or technology, or by sharp-elbowed lawyers. Members of Congress from both parties defer to the fans, and they periodically hold media-magnified hearings to admonish cheating athletes and the medical experts who help them. They're also trying to stop steroid use by high school athletes because of the dangerous side effects. Congress has extended drug laws to cover sports drugs, and on May 22, Sen. Joseph Biden, D-Del., chaired a hearing on the pending International Convention Against Doping in Sports. "These substances not only pose great health risks, they threaten the fundamental integrity of sport and send the wrong message to our kids--that cheating to get ahead is acceptable," he said.

Sports officials deal with these periodic controversies, yet also covertly welcome drug taking by athletes, said Charles Yesalis, a retired health policy professor at Pennsylvania State University who has studied the use of drugs in sports. Bigger, stronger, faster athletes break more records, produce more drama, attract larger TV audiences, and generate greater advertising revenues, he said.

Circumstances in the white-collar workplace are also amenable to employees' using performance-enhancing

drugs. There is not much obvious risk of lethal accidents, no visible pushback from workers against the drugs, and no sign that employers want to curb their use as long as it doesn't create problems with co-workers, such as "roid rage." The *Nature* survey indicates that many prestigious scientists and academics believe that they gain more than they risk.

The available data, and a proliferation of anecdotal evidence, suggest that there's a large off-label market for these drugs. In a recent survey at one East Coast university, about one-sixth of 1,200 college students said they used prescription drugs to help them study, said Amelia Arria, deputy director of the Center for Substance Abuse Research at the University of Maryland (College Park). Arria said she has applied for grant money to follow the students as they graduate into the workplace to see if their usage patterns continue.

College publications offer plenty of anecdotes. The February issue of the *Johns Hopkins News-Letter* described routine use of the drugs for study and quoted one student as saying, "I took [Adderall] for the first time this summer and took a class and got an A. That was awesome. Fall semester, while I was taking Adderall, I got three A's and an A-minus. That was a huge jump—I used to get B's and C's, and now I get all A's."

Beyond the *Nature* poll, there's also some evidence of drug use in other fields. In December, for example, the *Los Angeles Times* cited declarations of drug use by a professional poker player who wanted to maintain concentration during long games and a flutist who estimates that as many as 75 percent of her peers use beta-blockers to calm nervous fingers. Many workers who used drugs to boost productivity or improve their mental health while in college may be still using them in the workplace, NIH's Volkow said.

"I don't know of any objective, empirical evidence that describes the magnitude of the problem," Yesalis, the retired professor, said. But white-collar workers, like athletes, "live in a highly competitive environment, and if there were drugs that would help investment bankers and lawyers do what they do, why would anyone expect less use?"

If her grant comes through, Arria said, she'll be able to deliver some initial data on workplace drug use in two years.

Biological Nuance

Researchers also lack a good understanding of how these drugs affect people working in a variety of jobs.

Many students and workers already take mood-improving drugs such as Prozac to counter diagnosed cases of depression, which can reduce workplace performance. Antidepressants are so common that they're accepted by most employers and covered by health insurance policies, setting the stage for future backing and funding of drugs that more directly boost workplace performance.

There's evidence that stimulant drugs can help students who are cramming for exams, although test takers may actually perform worse if the effect has worn off, Volkow said. It is not clear if facts memorized with the aid of stimulants can be recalled years later by, say, a doctor in an emergency, she said.

Arria says that her 1,200-person study makes her skeptical about the drugs' value to students. "Over time and on average, the students who nonmedically use prescription drugs have lower performance, and it's because they're skipping classes," she said. "From what I know today, it is really the students who work, who don't skip class, who engage in healthy behavior who will be the ones who succeed."

Workers doing boring, repetitive tasks, especially for long hours, do get a boost from stimulant drugs, Volkow said. But performance may decline for white-collar employees who must sift through a wide variety of information. In 2003, for example, researchers at King's College London found that modafinil increased users' performance slightly on one set of tests but reduced it on another.

Drug-using employees may think their performance has improved even though they're actually doing worse, Volkow said. A person's ability to read social signals, such as facial expressions, is reduced by taking drugs that otherwise make him or her feel more able, she said. Further confusing the issue: Even if a drug is medically ineffective, it may cause a psychological "placebo effect" that prompts the drug taker to work better, Volkow said. Measuring effectiveness is difficult because it would require extensive testing on people in situations that fall outside normal ethical guidelines. Otherwise healthy professional athletes, for instance, can't be used as subjects in a controlled experiment to test the effectiveness of different levels of steroids.

The issue of harm is crucial to controlling the use of a substance, Volkow said. "If you have a medication that

does not have harmful effects, it will be hard to bring in regulations against it."

The health effects are compounded when approved pharmaceuticals are used without physician supervision, Arria said. Students taking drugs on their own face a greater danger of side effects, such as heart attacks, especially because they're also more likely to use additional legal and illegal drugs, she said. At the university she studied, most students "do perceive the nonmedical use of these drugs as harmful."

Industry Lobbying

A significant medical industry has developed that focuses on repairing problems or damage in the brain and nervous system. This broad sector includes companies trying to remedy Alzheimer's and Parkinson's, as well as schizophrenia and depression. Most of the companies' prospective products are drugs, although many patients are also aided by surgeries and inventions, such as cochlear implants that help deaf people hear, or electronic devices that can offset the symptoms of Parkinson's disease. There's no clear line between these subsectors, in part because products can be used for multiple purposes.

However, the chief regulatory problem for cognitive-enhancement drugs is a federal law that requires officials to approve a drug only for treating recognized medical maladies, such as schizophrenia. "There is no way to get it through to the market without going through the disease model," the Neurotechnology Industry Organization's Lynch said. In response, some pharmaceutical executives have labeled their brain-boosting drugs as an aid for "age associated memory impairment," he said. But officials at the Food and Drug Administration rejected that approach, one reason being that the claimed disorder is not widely recognized. That rebuff prompted executives to instead promise help for problems linked to accepted medical conditions, he said. For example, New Jersey-based Memory Pharmaceuticals is developing a new drug, MEM 3454, as a remedy for "cognitive impairment associated with schizophrenia" and Alzheimer's. About 75 percent of schizophrenia patients have difficulty remembering facts, or paying attention, or working on a task. The drug is undergoing safety tests; if it passes, the next step is efficacy testing.

Critics say that the industry's real goal is to get new drugs approved for recognized medical conditions so they can be offered to a potentially huge off-label marketplace of consumers seeking advantages at work. They've got evidence for such views: Cephalon, a large biopharmaceutical company, agreed to pay a \$425 million settlement to the federal government last year after the firm's sales force was accused of marketing its Provigil anti-sleep drug for purposes other than those for which it has been approved. Provigil was approved for treating narcolepsy, but it was used as a stimulant by some of the scientists who responded to the *Nature* poll.

In March, Lynch led an industry delegation on a Washington tour of federal officials and lawmakers to impress them with the need "to improve the lives of those with brain and nervous system illnesses," he said. The delegation met with officials at the FDA, which grants drug approvals, and the Centers for Medicare and Medicaid Services, which authorizes the purchase of novel drugs for the two programs. The executives also met with legislators, including Rep. Patrick Kennedy, D-R.I., who introduced the neurotechnology bill. Lynch's day-to-day lobbyist is Paul Stimers, who works in an "emerging technologies" group at Kirkpatrick & Lockhart Preston Gates Ellis.

Stimers promotes the neurotechnology bill with a battery of arguments in which he emphasizes brain repair rather than enhancement of ordinary brain functions. New therapies are needed to treat physical injuries and post-traumatic stress disorder suffered by troops who fought in Iraq and Afghanistan; new regulations are required to accelerate the transfer of laboratory discoveries to the marketplace; more research is needed to tackle a variety of medical disorders; and additional executive and legislative action is necessary to ensure that the U.S. stays ahead of foreign competitors, he says. "We're in a global competition on every front, and if we don't develop the technologies here, they will be developed elsewhere," Stimers told *National Journal*.

His message is getting through. The House bill has bipartisan sponsorship, and a Senate bill was introduced by Sens. Patty Murray, D-Wash., and Pete Domenici, R-N.M. "For the millions of Americans that suffer from a brain-related illness, and the thousands of Americans coming home from Iraq and Afghanistan with traumatic brain injury and PTSD, a new federal commitment to research and treatment can't wait," Murray and Domenici said in a May 7 statement.

But the bill faces significant obstacles, the most important of which is implicit opposition from NIH officials. "The devil is in the details," says Story Landis, director of the National Institute of Neurological Disorders and Stroke. For example, the bill would create a research coordination office, but NIH officials are already directing brain-related research, she said. Much additional work is needed before enhancement drugs can be approved, she

said, partly because different portions of the brain may react differently to novel drugs.

"I have some skepticism about the ability to target the drugs toward one type of receptor in a part of the brain," Landis said, adding, "The best thing that can happen is that the NIH budget in general is increased."

Ethics Issues

Study of the "ethical, legal, and social implications" of new discoveries, such as genetic sequencing, has become such a common component of scientific research that it has its own acronym, ELSI. The neurotechnology bill includes a section authorizing up to \$8 million a year to examine the ELSI component of cognitive-enhancement drugs. The future director of the proposed National Neurotechnology Coordination Office will decide how the ELSI money should be awarded, Stimers said, and it will likely be given to universities and think tanks to foster public discussions of the technology.

"The key is to have folks on the level-headed side of the spectrum engage on this issue so there's a counterweight to hair-on-fire sensationalism," Stimers said. "We didn't put anything in the bill that wouldn't help our cause."

But if the scientists control the ELSI money, they will use it to sway the debate in their favor, counters Cameron, the ethics professor. They'll try to co-opt critics, he said, and they won't fund people who would disagree with them.

Advocates for the new technology include industry lobbyists as well as ideological supporters such as Gregory Stock, the director of the Program on Science, Technology, and Society at UCLA's medical school. People should be allowed to use these drugs as they see fit, and regulation should be used only to deal with clear problems, such as drug dependence, just as alcohol is regulated, he said. "I feel strongly that people should have choices about the kind of [biological] intervention they're going to [want], as long as there's a baseline of information about safety," he said.

Any regulation would be difficult to implement, in no small measure because customers can often use Internet pharmacies to bypass the legal requirement of a doctor's prescription. In the *Nature* poll, one-third of the respondents who said they used drugs obtained them via the Internet, and two-thirds purchased them with a legal prescription. "There are large numbers of people that view these [drugs] as beneficial," Stock said, and if the government tries to enforce unpopular regulations, "you will create a [regulatory] regime that is far more damaging than anything the drugs could have done."

In contrast, Cameron favors rules that would prevent employers from pressuring workers to take drugs, akin to a law recently passed by Congress that bars companies from using genetic testing to covertly gauge the risks and benefits of hiring an individual or accepting a new health insurance enrollee. "We should have parallel protections from inducements, blandishments, and any other indirect and direct pressure to enhance performance," he said. Government can't stop people from taking drugs on their own time, but it should try to mark a bright line between private decisions and the professional pressures that might be imposed by employers, Cameron insisted. "The recognition of that line is hugely important, much more important than where you exactly draw it."

College officials are already concerned, Arria said: "They want to know how they can help raise awareness of the risks involved" in the illicit use of cognitive-enhancement drugs. Administrators shouldn't try to stigmatize use of approved drugs, she said, but should counter any tolerance of drug abuse. On campus, Arria said, "sticking with a task, learning what you can, following up, and doing all the things we learned how to do are somehow not in vogue anymore. It's more in vogue to say 'Wouldn't it be great to take a pill?'"

In the United States, regulation will likely come only after various controversies, such as reports of pressure on school children to take the drugs or tales of employers coercing workers into using them, arouse the public to demand action, Cameron said. But absent clear damage, public support for useful drugs will make regulation unlikely, Volkow predicted. "We live in a culture where there is a sense that you can overcome not just any ailment but any discomfort" with drugs, she said.

That outlook may provide comfort to the pharmaceutical industry, but executives are acutely sensitive to nascent public opposition to cognitive-enhancement drugs. Those forces have redirected embryonic-stem-cell research in the United States, shriveled sales of genetically modified food in Europe, and locked up nuclear technology for decades. Potential domestic curbs, Stimers said, are "the specter that haunts all of this."