

Ways to make you think better

Students and exhausted workers have been abusing stimulants for decades. But these days, if you're keen to feel sharper, and work for longer, the drugs available are more effective than they once were - and less likely to make you feel awful afterwards. No wonder then that the abuse of pills such as Ritalin and modafinil is becoming a major problem. Katharine Hibbert reports on the rise of cognitive-enhancing drugs - and doctors' fears over their long-term safety

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Mark is a good student. Intelligent and diligent, he won a place to read modern languages at one of Britain's top 10 universities. But in the run-up to his finals this summer, with a towering pile of revision still to go, the 23-year-old decided he wasn't going to be good enough. So he went on the internet, found an online pharmacy based in Turkey, and bought a pack of modafinil. It's a prescription drug given to narcoleptics, but it has also been shown to boost alertness and mental agility in healthy users. After a week of taking a tablet a day, sleeping only four hours a night, then, thanks to the drug, waking up refreshed, Mark took his exams. He got a first. Would he have done so well without pharmaceutical help? "Unlikely," he says.

Mark is not the only one. The British Medical Association believes that a growing number of healthy people in this country are illicitly using brain-boosting drugs that should really only be taken on prescription. More specifically, they're taking modafinil and Ritalin, a drug licensed for use in those suffering from attention deficit hyperactivity disorder (ADHD). Some people may find a way to obtain the drugs from a doctor, but if not, they are available from websites based abroad. The going rate for a dose is around £3.

Although the scale of the problem is as yet undefined in this country, there is evidence that self-dosing with brain-boosting drugs is already rife in the United States. There's thought to be a particular problem among students (some of whom have nicknamed Ritalin "Vitamin R"): in a survey of 1,025 students at a north-eastern US university, published in the *Journal of American College Health* last year, one in six of those who responded admitted taking prescription drugs illicitly, mainly to improve concentration and alertness. But even beyond the world of student panic, abuse of Ritalin (also known as "kiddie coke") is widespread. Meanwhile many millions of people who have problems with tiredness - truckers, for example, and night workers - are using modafinil. It's even been found in the systems of top American athletes during dope testing.

The BMA is so concerned about the use of such drugs on this side of the Atlantic that its medical ethics committee is today publishing a discussion paper on the ethics of cognitive-enhancement. The paper predicts that increasing use of Ritalin and modafinil in Britain is "both imminent and inevitable". One of the experts who produced the report, Barbara Sahakian, professor of neuropsychology at Cambridge University,

knows at first-hand how widely used the drugs already are. "I have been offered modafinil on several occasions when I've been at conferences, without asking for it," she says.

"My fellow academics have taken it to counteract jetlag and tiredness, and I've been offered it when I've complained about my own jet lag, or having been allocated a slot to talk late in the day. I haven't taken it - I work in the lab where we have many of these substances, so it would be unethical for me to be taking things off the shelves. But the use of these drugs is clearly quite widespread within the profession."

Such anecdotal evidence isn't hard to uncover; these are the sort of drugs that students talk about nowadays. Anna, 24, now a junior doctor, says that her use of prescription drugs to boost her ability to work was unexceptional while she was studying medicine at a Scottish university. "We'd have these revision parties. It was usually about three of us, we'd get wired on Ritalin, and I'd do my anatomy revision, another would work on her economics coursework, and the other would do a history of art essay. We'd sit there working like mad, really racing through it, totally focused, turning out good quality work for hours and hours.

"I ended up taking Ritalin in every exam during the first semester at medical school - I was just so snowed under that I couldn't cope with the work otherwise, and I was positive I was going to fail. I remember in the exam that I was pulling in knowledge from when I was at school. It all seemed to come into my head much better than it would normally - it might just have been psychosomatic, but it felt like it helped. And I passed every exam."

Dosing up on stimulants to improve focus and ward off tiredness is nothing new. Caffeine, amphetamines and other, harder drugs have long been used by people seeking ways to make their brains work better, for longer. The difference with modern drugs such as Ritalin - which is actually an amphetamine, but far more subtle than old-fashioned "speed" - is that they have been developed to minimise both unpleasant side-effects and the risk of addiction.

Ritalin, the trade name in the UK for the drug methylphenidate, was invented in 1954 and first prescribed to ADHD sufferers in the 1960s, but its use rocketed during the 90s. In the US, doctors write 3m prescriptions for the drug every month; here doctors average more than 30,000 a month. Although Ritalin is medically a stimulant, it calms those who suffer from ADHD, making them more able to concentrate on the task in hand, and has similar effects on healthy users (although it can also cause insomnia, headaches and heart palpitations.) The fact that it's currently so widely prescribed to even very young children makes many adults think that it must be perfectly safe to take.

Modafinil, meanwhile, has been prescribed in the UK since 1997, and has similar effects, but it also works to stave off tiredness without the slight euphoric high and cardiovascular effects brought on by Ritalin, which can be dangerous for those with weak hearts. Neither drug is considered addictive at the doses normally prescribed - although it is possible to develop a psychological dependence.

Sahakian and a team of researchers at Cambridge tested modafinil on healthy male undergraduates in 2003. Those who took a single 200mg dose were found to use information more efficiently within two hours of taking it. They were better at mental planning tests, completed puzzles more accurately, could remember longer strings of digits and recognise pictures more quickly. Long-term memory was not enhanced, but the increased ability to concentrate for longer periods of time would, the researchers say, allow them to learn more. Modafinil has also been tested by both the British and American armed forces, and could one day offer a substitute for the caffeine and amphetamine "go pills" the US army and air force have long relied on for night-time operations.

But the new BMA paper emphasises that the long-term side-effects of using such drugs are unknown: they may turn out to be harmful. Such risks may be worthwhile for those suffering from the conditions the drugs were created to treat, but perhaps not for a healthy user. The report highlights speculation among academics that there could be particular dangers for children and younger people who take the drugs while their brains are developing, and that people who use cognitive-enhancing pharmaceuticals in their youth may become more susceptible to premature cognitive decline as they age. "We simply do not know what the long-term effect of the use of such drugs in healthy populations will be," the report concludes. Whether or not the drugs should be so widely prescribed, especially to primary school children, is a matter of some controversy. But it seems clear that healthy young adults are taking a gamble when they dabble with them.

This may not be enough to put everyone off. Modafinil's apparent harmlessness persuaded John, who is studying for a neuroscience PhD in London, to try it. "When I was thinking about taking modafinil, I read the scientific studies," the 29-year-old says. "I've never even taken cannabis, let alone any harder drugs, but I thought modafinil might benefit me. Sometimes I find it hard to concentrate, some days I'm just tired out and I need to work. A friend who's a doctor wrote me a prescription - he uses it occasionally himself. I've also bought it off the internet. For me, it's something to have in the medicine cupboard in case you're totally exhausted and just need to get through the day. I only use it maybe once or twice a month - it's just a nice backup. It doesn't feel like much, it just stops you from feeling sleepy, takes away that mid-afternoon drop-off. You certainly wouldn't take it for enjoyment, for its own sake. I don't notice any side-effects - sometimes my mouth goes a bit dry, but that's all."

The idea of competing with pharmaceutically enhanced peers at work or university will strike many as deeply unfair. "It may not be a fair thing that I took modafinil," Mark says, "but so many students have Ritalin and other drugs, some who have been prescribed it for more or less spurious reasons, or others who can just get hold of it one way or another. Loads of students I knew were using it to stay up and write essays. And at that particular time, this particular drug seemed quite helpful to me, so I didn't feel too bad about taking it."

And the playing field isn't exactly level anyway, since many students will be legitimately prescribed drugs by doctors even if their peers might not consider them ill. "Prescribing Ritalin for ADHD brings a grey area," Sahakian says. "It's a spectrum disorder, and while at one end it can be deeply debilitating, many people are diagnosed for much more minor symptoms. Studies in America have shown a huge variation in diagnosis rates - in some areas up to one in five children have it prescribed to them. The line between enhancement and treatment is a subjective decision, and if students have found someone who will prescribe where other doctors might not, then they are already going into exams on drugs, where other students, with similar symptoms, are not. The pressure to compete is already boosting prescribed use of these drugs - we hear about parents putting pressure on doctors to prescribe Ritalin because they think that everyone else's children are taking it.

"And maybe people who have the money will be able to afford cognitive-enhancing drugs that aren't prescribed - so people who are already limited in finances and background will be even more disadvantaged. But then that's already the case, as they can afford better education, better food, more extra-curricular lessons."

Trevor Robbins, professor of neuroscience at Cambridge University, who has carried out extensive research on drugs for cognitive enhancement and on drug abuse, is surprisingly sanguine about the use of these drugs by healthy adults. "We already enhance our performance in all sorts of ways," he says. "Some of us wear contact lenses, some of us drink coffee. Some may be horrified that normal people would take drugs to improve their performance, but if you called it a food or a drink, they wouldn't bat an

eyelid - people take fish oil because it may make their brains work better, but drugs have a stigma to them.

"I don't really see any argument against self-improvement in itself, except in a competitive situation - in exams, for example. Then it's analogous with doping in competitive sport. But what can you do? Even if you do drug tests in the exam hall, people might have used modafinil to improve their learning on a course in November, for instance, then taken the exam in July. How are you going to test it by then?"

Both Robbins and Sahakian believe that the use of the drugs is set to grow, no matter what regulation is put in place. The BMA report concurs, acknowledging that even if the drugs were banned in Britain, it would take international laws to prevent them from being sold over the internet. And right now there are more mind-sharpening medicines in development, and those who want to enhance their mental performance may soon be able to choose, legally or illegally, from a wider range of drugs, each operating on different parts of the brain. The Alzheimer's drug Donepezil, for example, has been shown to delay loss of mental ability in patients, and improve memory in those without dementia. Early clinical trials, meanwhile, suggest that a new and so far unlicensed class of drugs, ampakines, may enhance learning capacity and memory in healthy users, as well as increasing attention span and alertness.

Drugs may not negate the need for talent, creativity and self-discipline in achieving success. But even if the ethics and the uncertainties about long-term risks are hard to swallow, more and more people may soon find themselves tempted by the chance to be sharper, smarter and more alert if it's on offer in tablet form.

- Some names have been changed.

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