# A REVIEW ON THE FUTURE OF WORK: PERFORMANCE-ENHANCING DRUGS

## 1. Introduction

The use of drugs for non-medical reasons as cognitive enhancers is starting to spread and become normalised among students and certain groups of workers. In the context of increasingly competitive society and working environment the use of these performance-enhancing drugs is expected to grow in the future while the long-term consequences are still unknown.

## 2. What are performance-enhancing drugs?

'Cognitive-enhancing drugs' are pharmaceutical substances claimed to improve mental performance, such as focus, concentration, memory or motivation. More broadly, 'performance-enhancing drugs' also include claims to improve the acquisition of motor skill, or affective skills, such as dealing with anxiety associated with performing certain work tasks or promoting feelings of trust and affiliation.

But no drugs are licensed by state medical authorities to be prescribed as 'cognitive enhancers' as such. The term 'performance-enhancing drugs' usually refers to the off-label use of drugs prescribed for specific medical conditions (e.g. modafinil usually prescribed for narcolepsy; methylphenidate for Attention Deficit Hyperactivity Disorder - ADHD) by healthy individuals, for the purposes of performance enhancement. Employees obtain the drugs by another means such as buying them off someone who does have a prescription or off the internet.

Marketing and availability of these products through the internet has also changed the culture in which drugs are purchased and used: this can appear 'safer' (although there is no guarantee the drugs are what they are claimed to be) than the potential dangers and stigma of street drug dealing.

## 3. Current main performance-enhancing drugs

It is complicated to map the field of cognitive enhancers/performance-enhancing drugs. However, there are three main pharmaceutical drugs which are commonly associated with cognitive enhancing:

- **Amphetamines** – stimulants used to treat ADHD or narcolepsy. They increase dopamine levels. Adderall (trade name) is a mixture of amphetamine salts. It may be used off-label for the enhancement effects of increased focus (especially for study) or for euphoria ('high'). Other branded amphetamines in this category include Dexamed (dexamfetamine sulphate), also branded in Europe as Attentin and Tentin.
- **Methylphenidate** - is a central nervous system stimulant used for treating ADHD and narcolepsy. It increases levels of the neurotransmitters dopamine and norepinephrine. Trade names include Ritalin, Concerta, Equasym, Medikinet and Rubifen.
- **Modafinil/Armodafinil** – is another stimulant to the central nervous system and promotes wakefulness. Its exact action on the brain is not fully understood but it is known to interact with neurotransmitters such as dopamine and norepinephrine. Trade names in Europe include Provigil, Nuvigil, Vigil, Modalert, Modasomil and Modiodal.

# 4. Prevalence of current use

Ascertaining quantitative measures of prevalence of cognitive enhancers is difficult, particularly due to non-prescribed use and internet sales. However, there is evidence of specific groups using or abusing of performance-enhancing drugs in the context of employment and the workplace:

**Military:** modafinil is made available to combat personnel serving with various military forces under medical supervision and clearly defined circumstances.

**Transportation workers:** long distance transport workers are associated with the use stimulants (principally amphetamines) to cope with long shifts.

**Shift workers,** including emergency services and healthcare, are related to the use of performance-enhancing drugs to aid wakefulness and to cope with work/life balance. Shift Work Sleep Disorder is a diagnostic category in the USA with modafinil recognised as a medically approved treatment to promote alertness. Prescription in the EU was also possible for the condition Shift Work Sleep Disorder until the restriction imposed by the European Medicines Agency (EMA) in 2011.

**Other groups** of workers in high pressure, competitive or bullying work cultures, including city traders, academics and lawyers, are associated with the use of these drugs for a variety of reasons, e.g. to cope with the demands of the work, to improve productivity or to overcome jetlag.

There is also evidence of the use of 'study drugs' such as modafinil and Ritalin among **students** as an aid to enhance study, focus, concentration and memory. The use of these substances is rising not only at universities but also at schools. Those students who have already used performance-enhancing drugs may be more likely to continue use as they move into graduate occupations.

# 5. Effects of the use of performance-enhancing drugs on workers and on work

Cognitive-enhancing drugs provide a stimulus to the body's central nervous system. In general terms they have the potential to produce a degree of alertness or the ability to concentrate on a task (e.g. increased attention span) with the effects and their duration depending on dosage and period of treatment/consumption, albeit subject to individual differences.

The findings from a number of scientific studies do not seem to be in agreement with regard to the enhancing potential of these drugs in healthy individuals, nor do they agree on the side effects, for both short and long term usage, including their addictive potential. Causal effects of drugs have been tested within patients with health problems but there are no studies with healthy users.

Performance-enhancing drugs are not predominantly used under prescription and medical advice so the doses used are not under medical supervision. Individual tolerance to the drugs usually increases over time, therefore posing the problem of employees taking increasing amounts, and the chances of adverse side-effects and addiction increase with higher doses.

Although the focus of performance-enhancing drugs is on cognitive effects, they simultaneously have physical and emotional effects which should not be overlooked. The knowledge of physical effects is more certain than in the case of cognitive/emotional ones. Adverse side effects may pose a risk both to the organisation of work as well as to the employees concerned and the may be subject to important individual differences. Those effects can include:

**Amphetamines:** increased risk of heart problems, high blood pressure and stroke; tolerance and addiction; mental health problems; sudden discontinuation can produce withdrawal symptoms.

**Methylphenidate:** similar risks to amphetamines but potentially less addictive; more adverse symptoms through long term use, especially psychotic disorders in children.

**Modafinil:** skin reactions; cardiac events, high blood pressure and arrhythmias; psychotic disorders. Considered to pose a low risk of dependency in short term use but dependence for long term use has not been ruled out.

In considering the effects of the drugs, it is important to note that research shows that although there may be improvements in the performance of some cognitive tasks, the performance of others may be degraded. In addition, overconfidence with abilities overestimated could be problematic in the context of decision making in critical situations. Overconfidence could also pose a problem in the context of teamwork, potentially undermining group cohesion and co-operation.

Any effect of performance-enhancing drugs on mood, emotion or motivation has a potential to impact performance at work, including relationships with others and teamwork. A trade-off between increasing concentration or focus and a decrease in sociability would be useful when individuals work alone on a task but could be problematic in the context of teamwork.

# 6. Implications for occupational safety and health

The general potential risks arising from the use of performance-enhancing drugs on workers and on work have been described above. However, the use of these drugs poses other occupational safety and health (OSH) problems in the workplace:

- Management efforts to increase productivity may lead to either direct coercion or indirect expectations – social pressure to conform - on employees to use drugs, given the inherent imbalance of power in the employment relationship and that it is just as likely that managers and senior professionals themselves could be users. Employee choice and discretion are thus seriously reduced, with consequences for employee motivation and commitment.
- The use of performance-enhancing drugs will give some employees an unfair advantage over others and may pose a risk of discrimination by employers against individuals who choose not to engage in such enhancement.
- Enhanced employees might become seen as the norm and there is a possibility of creating expectations of ‘medicated normality’ and a lack of tolerance of differences (including of disabilities and age) within the workplace.
- Performance-enhancing drugs might be seen as a ‘solution’ to organisational or management problems within an organisation, becoming an alternative to preventive measures and adequately managing arrangements around work, e.g. rearranging schedules, adequate rest breaks or education of shift workers in the management of circadian rhythms.
- Some employees might use cognitive enhancers to retain their usual level of performance, whilst others might try to push themselves beyond their ‘normal’ limits. In both cases there is a matter of individual adaptation as a means of coping with the demands of the workplace instead of the necessary adaptation of the work to the individual.
- The assumption that performance enhancement can be achieved by individuals taking enhancing drugs might lead to cultures where it is accepted that employees will work longer hours, take on more intensive work loads, be able to cope with working at a greater pace, etc. In the longer term this has consequences on the safety and health of workers (e.g. employee burnout and unforced errors), but also on the reputation of the organization.
- At present there is not a distinct group of drugs which can be obtained and used for cognitive enhancing. Existing prescription drugs used off-label, some illicit drugs, and over-the-counter nutritional and other substances are used for these purposes. OSH responses need to take this diversity and lack of medical guidance into account.

In relation to the management of OSH, cognitive-enhancing drugs present issues for welfare/health provision and workplace drug testing.

Existing OSH approaches tend to assume that drug use (including alcohol) is primarily a non-work activity and poses a problem for the workplace, linking any sort of drug use with poor work performance. But performance-enhancing drugs are used to cope with or to enhance work, sometimes with explicit or tacit approval or acceptance by an organisation. Thus, if existing workplace drug policy and procedure assume that drug use necessarily impairs performance, then this is not a useful basis to consider policy for substances that are at least intended to improve performance and safety (even if this is not substantiated in practice).

Furthermore, traditional approaches to drug use and the workplace tend to focus on the individual worker as drug (ab)user, defining them as a problem to be treated either through disciplinary procedure or through welfare programmes. This is a very partial approach which brackets off the work environment itself and the interaction between employee and their working conditions. Welfare or wellbeing schemes which only focus on the individual employee will be unable to adequately address cognitive enhancers use in the workplace.

Existing research into substance abuse in the workplace links individual behaviours with employment characteristics. A preventive OSH approach to the issue should identify and adapt the working conditions that lead employees to use cognitive enhancers, e.g. long shifts, high demands of the work or pressure to improve productivity.

Another issue for employers is how and whether to determine if workers are using performance-enhancing drugs in order to cope with work.

In the context of health surveillance there may be a problem of under-reporting as workers may not want to be associated with the use of performance-enhancing drugs or they do not see these substances as ‘drugs’.

In relation to drug testing, it is problematic and controversial. Attitudes to and practices around workplace drug testing vary between countries. Specific legislation exists only in Ireland, Finland and Norway. Elsewhere practices steer a course between the thorny issues of individual freedom compared to duty of care and a safe working environment; and employee consent balanced against a fundamental right to privacy. On the whole, European approaches tend to avoid the culture of random employee testing prevalent in the US, tending more towards a pragmatic consideration of occupations which are seen as ‘safety critical’ and of the health and wellbeing of individual employees.

Existing tests do not measure the amount of drugs in an individual’s system, but the enzymes into which the drugs metabolise. Thus drug tests cannot test for impairment or intoxication at the time of testing. There is also a significant problem of the false positive.

All of these factors suggest that the discussion about Europe-wide random workplace drugs testing to deal with the increased use of performance-enhancing drugs, would in itself be inadequate to deal with the health and safety and other employment issues related to the use of these drugs in the workplace.

# 7. Concluding remarks

The effect of performance-enhancing drugs on OSH and other managerial issues is complex. This is an evolving area, which suggests dynamic changes in the future.

Future changes will depend on particular economic and employment developments, including:

a. Both the pharmaceutical industry and some sections of the public may have an interest in seeing the development of specific drugs for cognitive/performance enhancement. New drugs and uses for existing drugs are constantly being developed and trialled.
b. Although at present, prescription is limited to medical therapy, either a change in attitude towards prescription for human enhancement purposes or the development of cognitive-enhancing drugs which are acknowledged to be safe and therefore can be sold over-the-counter for enhancement, would significantly increase the availability and acceptance of enhancement through drugs.

c. Employment relations which lead to high-pressure, highly competitive workplaces, high-stress and low employee control workplaces, are likely to increase the perceived need and use of performance-enhancing drugs.

More work needs to be done to better understand the potential effects of performance enhancement drugs in the workplace. The amount of literature that continues to be generated on this is enormous, and the different views reflect the broad range of interested actors, including neuroscientists, ethicists, popular media, the biohacking community, and professional bodies representing various occupations. Thus there is a growing need for dialogue and the formulation of health and safety policy and practice that specifically addresses this area.

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