

Maverick* Research: Cognitive Enhancement Drugs Are Changing Your Business

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Competitive and social pressures are pushing knowledge workers, including IT professionals, to experiment with cognitive enhancement drugs. CIOs in the vanguard will be the first impacted and must take an early leadership position. (Maverick research exposes unconventional thinking and advice.)

Specific Maverick Caution

This research opens the discussion of cognitive enhancement drugs (CEDs) in the workplace and how CIOs and other IT leaders can understand the motivations and potential impacts of pharmacological cognitive enhancement in the modern workforce.

Maverick Findings

- Several drugs are currently used to improve creativity, attention, executive function and working memory. Use of CEDs is still low in enterprises, but will grow as anxiety increases over the performance demands required in today's organizations.
- Drugs popularly used for cognitive enhancement *do not increase intelligence*. They may complement intelligence by improving executive function and working memory.
- CED use won't be limited to the IT department, but will be more pronounced there — driven by increasingly monitoring-centric cultures, rising job security anxiety as AI automation looms, and the pressure of being the linchpin in enabling digital business.

Maverick Recommendations

- Gain general management buy-in to pilot a learning experience for the company if early CED use is known or suspected in the IT department.
- Draft a general policy around CED use in your organization by engaging with your chief HR officer, or equivalent. By introducing this new policy as a pilot in IT, the CIO will influence the policy's creation — including the perspective on how to treat CEDs as a controlled exception to existing substance use/abuse policies.

- Support non-pharmaceutical cognitive enhancement (NPCE) by adopting low-risk, proven strategies: improving work-life balance, adjusting work schedules, promoting physical activity, and educating employees on healthy nutrition and sleep practices.

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*Maverick Research

This is "Maverick" research, designed to spark new, unconventional insights. Maverick research is unconstrained by our typical broad consensus-formation process to deliver breakthrough, innovative and disruptive ideas from our research incubator. We are publishing a collection of several Maverick research lines this year, all designed for maximum value and impact. We'll explore each of these lines of research to help you be ahead of the mainstream and take advantage of trends and insights that could impact your IT strategy and your organization (see Note 1).

Analysis

Performance-enhancing drugs have largely been the domain of athletes and performers seeking faster recovery, improved endurance, reduced anxiety, or simply to prolong a fading career. However, knowledge workers face similar competitive pressures across a global marketplace and within their own firms. The need for improved creativity and focus — in order to come up with the next big idea, or to think more deeply about strategic challenges — is driving these workers to their own brand of performance-enhancing drugs to improve cognitive abilities.

Cognitive enhancement will first find a home in IT. Performance demands on IT staff have escalated drastically under the moniker of digital business (see "2017 CEO Survey: CIOs Must Scale Up Digital Business"). As IT organizations increasingly rely on key performance indicators (KPIs) to measure and judge individual performance, the previous culture of trust has been replaced by one of monitoring.¹ IT staff may turn to cognitive enhancement drugs (CEDs), also called "nootropics," as a coping mechanism for increasingly demanding corporate and social structures.

This isn't an abstract concept. "Smart drugs," such as modafinil, methylphenidate and dextroamphetamine, are already used in several diverse populations to improve memory, attention, motivation or creativity:

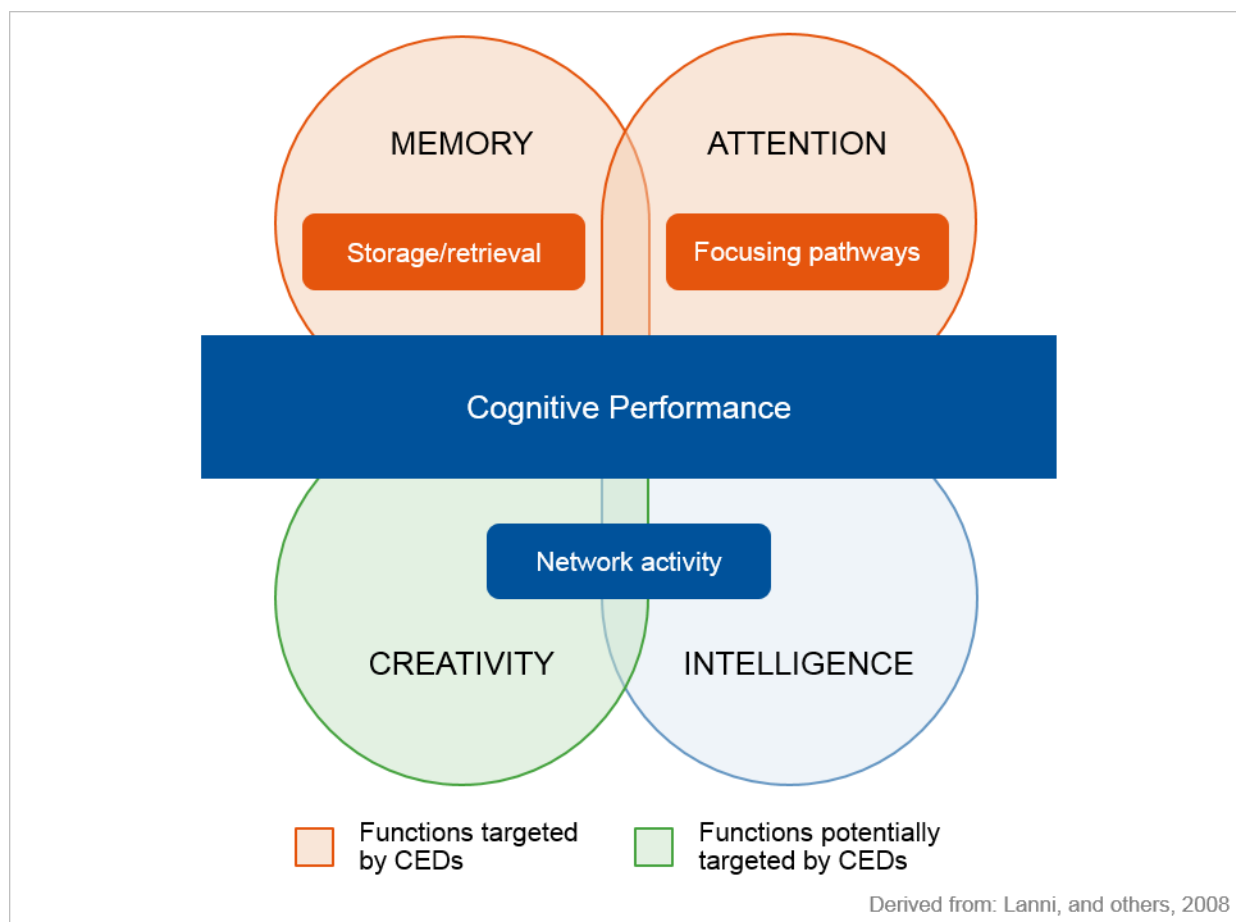
- As far back as 2008, the journal "Nature" ran an informal survey of its readers, with 1,400 respondents across 60 countries. Twenty percent of respondents said they had used CEDs, primarily to improve concentration, focus or memory.²
- In an anonymous, randomized survey of 1,145 surgeons, 19.9% admitted to using CEDs at least once in their careers. Motivations for drug use included the pressure to perform at work, and in their private lives, while coping with high workloads.³
- At the extreme end of the spectrum, some workers in Silicon Valley have begun taking microdoses — defined as one-tenth of a dose — of the psychedelic LSD. Proponents claim the small dose improves creativity, focus and motivation without the psychoactive effects.⁴ No studies have confirmed these effects,⁵ but the lack of objective data and reproducible studies is unlikely to deter use by some experimenters.
- College campuses, particularly in the U.S., have become fertile ground for CEDs. A 2014 analysis of more than 10,000 students across 18 schools indicated that, on average, 10.7% of students had taken prescription stimulants without a prescription during the past year.⁶ Motivations were, predominantly, to improve concentration, studying efficiency and alertness.

Regardless of the surveyed population, the motivations for CED use are consistent. Given the pace of change for both technologies and skills in IT, the need to cope with increasing business pressure around digitalization, and increasing anxiety around artificial intelligence (AI)-driven job losses, CEDs will find a home in your IT department if they haven't already. This introduces several questions around the opportunities and risks of CEDs; the first of which is, do CEDs actually make you smarter?

Do "Smart Drugs" Make You Smarter?

Evaluating the effectiveness of CEDs is more complicated than evaluating performance-enhancing drugs. The outcome of an athletic event is rarely in question: one participant or team outperforms fellow competitors by some metric, such as score or time. The physical functions contributing to athletic performance are discrete. By comparison, cognitive performance is a complex domain of interrelated functions (see Figure 1).

Figure 1. Distinct Cognitive Functions and Interrelated Influence



Source: Adapted from Lanni and others

Broadly speaking, cognitive performance is the aggregate of memory, attention, creativity and intelligence. Today's CEDs do not improve intelligence, but they may foster creativity by improving the necessary prerequisites of executive functions and working memory:

- Executive functions are cognitive processes that include organization and planning, resolving complex problems, inhibiting irrelevant responses and promoting relevant information.⁷
- Working memory is the ability to store and manipulate tactically relevant information over a short time frame.⁸

Improvements in these areas only give the *appearance* of increased intelligence — primarily by reducing interference from external stimuli, thoughts and actions.^{7,9} CEDs may also lower cognitive inhibition, thereby allowing ideas to surface that may otherwise be suppressed.

However, reducing interference may not benefit everyone equally. People with less experience — who tend to be more impulsive in their decision making — will likely get more benefit from CEDs than their more experienced colleagues.⁷ Baseline cognitive performance also appears to impact the usefulness and effectiveness of CEDs: Studies indicate that modafinil, used to treat narcolepsy and improve wakefulness, is more effective at improving performance for attention-related tasks for those with lower baseline cognitive performance (see Note 2).⁹

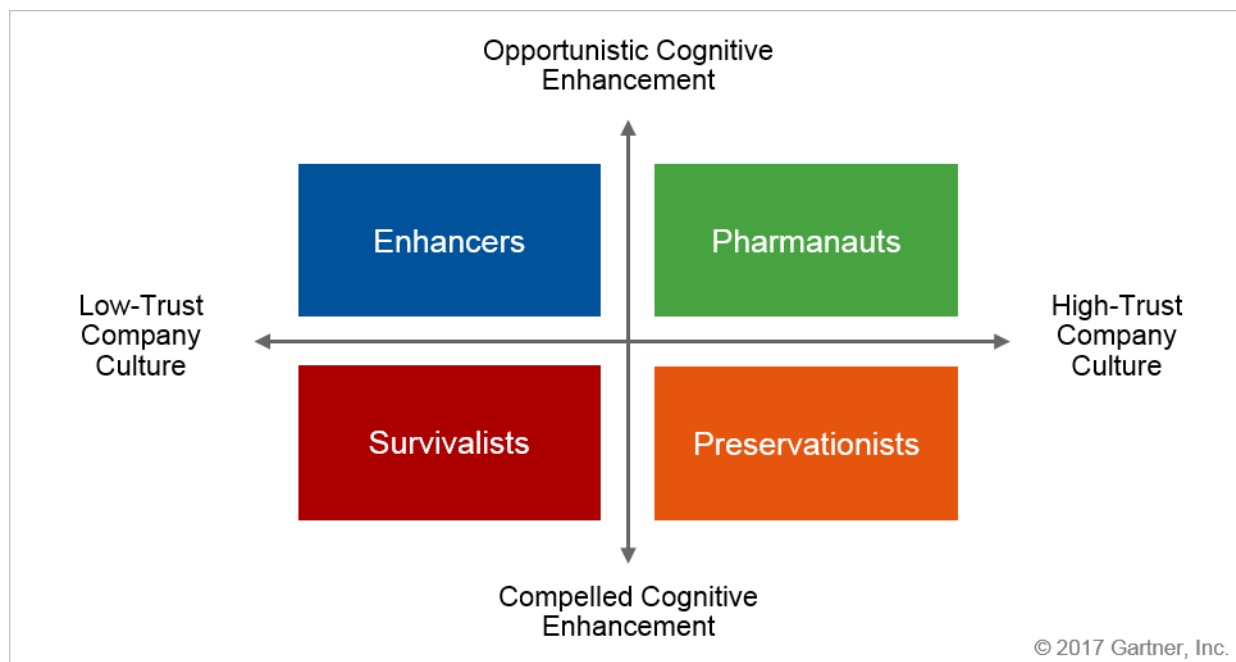
Improved executive function and working memory may also come at the cost of cognitive speed. A 2015 research study investigated the impact of CEDs on chess — a cognitively complex game. All players taking nonplacebo drugs experienced improved working memory and performance improvements between 9% (using caffeine) and 15% (using modafinil).⁷ However, these improvements came at a cost: players taking CEDs took longer to make their moves. These players actually performed worse than the control group if players had to make a move within a time limit.

Despite the hype around "smart drugs," these substances have no proven, quantifiable impact on intelligence or creativity. At best, they support the executive functions that allow individuals to better harness their existing creativity and intelligence.

Scenarios for CED Adoption

There are four potential scenarios for individuals using CEDs in organizations (see Figure 2). The core factors are company culture (low trust versus high trust) and whether an individual considers CEDs to be an opportunity to push cognitive boundaries or feels coerced into taking them to maintain performance and keep up with their workload.

Figure 2. Scenarios for CED Use by Individuals Within Organizations



Source: Gartner (September 2017)

Enhancers

In the Enhancers scenario, individuals working in low-trust organizations willingly take CEDs to support reaching their specific performance targets. This scenario may be prevalent in financial trading, call centers and healthcare, among others. The risk to Enhancers is relying on increasingly large drug dosages, because an already good performance must continue to improve. Side effects may become more pronounced and individuals may start to lose their sense of self as CEDs become "essential" to performance. Organizations are also at risk: If Enhancers are successful, it may compel others to start taking CEDs to remain competitive.

Survivalists

The Survivalists are reluctant users of CEDs and arguably the most at risk. These employees feel coerced into improving, or simply maintaining, their performance just to stay employed. This coercion may come from peers, management or an untenable work environment. Survivalists are likely to take large doses of CEDs as a coping mechanism. The potential risks, in the form of side effects or psychological dependency, cannot be overstated for Survivalists, but the organization shares that risk. While positive outcomes are possible (as discussed below), they are outweighed by the negatives — including legal liability around worker safety and coercion.

Preservationists

In the Preservationist scenario, individuals still feel compelled to take CEDs, but the motivations are team-based rather than metrics-based. This scenario could also be called "steady state." Preservationists perform at a high level and believe they need enhancement to keep up with a high-performing team. Alternatively, these individuals may be older than the average age of the team and see CEDs as a way to bridge the age gap. These individuals may view CEDs as restoring performance, rather than enhancing it. The risk to Preservationists is that, since they are already high performers, CEDs may be little more than a placebo, sometimes with unpleasant side effects (see Note 3). Certain CEDs may actually impair performance in high-performing individuals. Organizational risk in the Preservationist scenario is largely the same as in the Survivalist scenario, with one addition. If individuals believe CEDs are required for joining or keeping up with a team, they may simply leave the organization rather than start doping.

Pharmanauts

Those in the Pharmanaut scenario are pure opportunists and likely to seize any opportunity for cognitive enhancement. These workers don't need to be coerced. They are likely to be in the front line of CED adoption and may directly or indirectly introduce CEDs to their colleagues. Their eagerness to try new CEDs, or new combinations of CEDs, may get them into trouble with side effects and damaging drug interactions. This thrill-seeking behavior may also impact their team through unpredictable day-to-day performance.

Advantages of CEDs in the Enterprise

The scenarios outlined above highlight the negative outcomes for CEDs in the workplace, but there are also two compelling opportunities around strategic and competitive insights and workforce performance.

Synthesizing New Insights

Today's organizations and individuals are captivated by analysis, but not all problems are solvable with reductive analytics: data may not be available, it may be incomplete or ambiguous or there may be opposing points of view (see "Maverick* Research: We Analyze Too Much, and Synthesize Too Little"). Solving problems with disconnected or potentially incoherent elements requires more than studying the elements themselves. Resolving these dilemmas requires the ability to creatively synthesize new ideas and insights. Elements must be recombined to look for new commonalities and contexts.

Synthesis requires creativity and intellectual rigor, two things supported by improved executive function and working memory, and the suppression of psychological inhibition and interference. It's easy to envision scenario planning sessions where some or all participants are enhanced by their chosen CEDs. CEDs may drive more creative solutions to seemingly intractable problems by suppressing cognitive inhibition and allowing new ideas to emerge. Also, since CEDs support those with lower baseline performance (see Note 2), it's possible to see an increase in the overall cognitive performance of a team of mixed performers.

Supporting Workers at the Lower End of the Cognitive Spectrum

For the individuals with lower baseline cognitive performance, the improved cognitive function with CEDs benefits both the individual and enterprise through higher productivity and, possibly, improved creativity. CEDs may also help inexperienced staff learn new tasks more quickly and with fewer mistakes by reducing cognitive interference from previous experience.⁷

Improving cognitive function in lower-performing individuals may also have a broad societal impact. It's possible that some individuals have undiagnosed attention problems and use CEDs to unintentionally self-medicate, rather than intentionally enhance (see Note 4). If CEDs supplement cognitive abilities, it could be argued that their use may be of benefit in the removal of societal disparities and in reducing undiagnosed cognitive disorders.¹⁰ In macroeconomic terms, what is the impact of a populationwide increase in IQ? According to one simulation, a 3% increase in IQ means a 25% reduction in poverty and 1.5% growth in GDP.¹⁰ Although just a simulation, the broader impacts of CEDs revealed are intriguing and may warrant dedicated research.

Finally, the use of CEDs by those most likely to benefit may alleviate the ethical challenge of equality of CED access, discussed below.

The Ethics of Cognitive Enhancement

Several ethical issues emerge when healthy people take CEDs to improve cognitive ability. Questions about the legality of obtaining these drugs and the potential side effects are obvious. Less obvious, are the cognitive trade-offs the healthy may be unknowingly making and the potential impact on personality.

Legal Status of CEDs

Understanding the legal status of CEDs is challenging. Dozens of drugs and substances are used for cognitive enhancement and there is little consistency in how national drug administrations classify them (see Note 3). Figure 3 summarizes the regulatory status of several popular CEDs.

Figure 3. Regulatory Status of Some Popular CEDs in the U.S.

Regulated in the U.S.	Unapproved in the U.S.	Unregulated
Beta blockers Cocaine [†] Dextroamphetamine [†] Donepezil Galantamine LSD* Methylphenidate [†] Modafinil [‡] Pyritinol Vasopressin	Aniracetam Phenylpiracetam Picamilon Piracetam Vinpocetine	Caffeine Chromium Creatine DMAE Niacin

* Schedule I drug † Schedule II drug ‡ Schedule IV drug

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Source: Gartner (September 2017)

In addition to regulation by the U.S. Food and Drug Administration (FDA), five popular CEDs are also regulated under the U.S. Controlled Substances Act (CSA) because of their potential for abuse, among other criteria: cocaine, dextroamphetamine, LSD, methylphenidate and modafinil.

Today's regulated CEDs are either obtained legally via prescription, illegally from someone else with a valid prescription or, most popularly, from one of several dozen unregulated websites with questionable and unverified quality standards. This may expose organizations to legal risk if CED users obtain drugs illegally because they felt coerced by colleagues or management.

Stacking Side Effects

Much like their performance-enhancing counterparts, CEDs are rarely taken individually. It's common for CED users to take a "stack" of drugs to either suppress negative side effects or to highlight positive cognitive effects.¹¹ This can introduce unexpected drug interactions and side effects.

The potential for significant interaction side effects is increased based on the unregulated way in which many CEDs are obtained and the "pseudoscience" surrounding dosages and varying drug stack components.

Overestimating Cognitive Abilities

Another risk of CEDs in the enterprise is that CED users may actually introduce more errors into their work. Users of CEDs such as modafinil and methylphenidate tend to overestimate the amount of cognitive improvement these drugs ultimately provide. This leads them to overestimate their

abilities while doping. The overconfidence introduced by CEDs may make users more impulsive and they may react before they have all relevant information.¹

Social Coercion

As described in the scenarios above, a demanding team or work culture may coerce healthy individuals into taking CEDs. This pressure to perform better or to achieve a specific mental state is arguably unethical, because it violates individual autonomy. However, the ethics of coercion are rarely considered when social pressures mount: in the previously cited "Nature" survey, 33% of respondents said they would feel pressured to give their children CEDs if other children at their school were also taking them.¹²

Impact on Authenticity

CEDs potentially alter what it means to be our true, authentic selves. If knowledge workers are only valued or judged based on their attention and memory, the risk is that they perceive themselves as mechanistic and somehow less than human. This dehumanization may also negatively impact the psychological benefit knowledge workers get from work and personal achievement.¹²

Recommendations

CEDs entering the workplace reflects a relationship change between knowledge workers — particularly those in IT — and the enterprise. While there may be benefits to CEDs for certain worker populations, enterprises must evaluate how the potential ethical and legal impacts will affect both their workers and the overall organization. The organization, starting in IT, must determine how to best support workers that are turning to pharmacological cognitive enhancement in order to meet excessive demands.

Recommendations for CIOs defining a leadership position for CEDs in the enterprise are as follows:

- *Gain general management buy-in to pilot a learning experience for the company if early CED use is known or suspected in the IT department.*
 - Anonymously survey the IT department to uncover early CED use and to understand the motivations behind it. Staff may be overwhelmed, and using CEDs to compensate, or simply experimenting to improve productivity. The former requires proactive leadership to resolve the underlying problems, while the latter may only require passive monitoring.
- *Draft a general policy around CED use in your organization by engaging with your chief HR officer, or equivalent. By introducing this new policy as a pilot in IT, the CIO will influence the policy's creation — including a perspective on how to treat the use of CEDs as a controlled exception to existing substance use/abuse policies.*
 - Ensure this policy prioritizes IT, because it might be a problem area for CEDs. Also, ensure the policy allows you to remediate problems without having to automatically dismiss staff.
 - Determine how you will support staff undergoing burnout or psychological distress due to performance pressures. Professional sports teams are supported by psychologists,

coaches and other mentors, and those support avenues may be required in the enterprise as performance pressure increases.

- *Support NPCE by adopting low-risk, proven strategies: Improving work-life balance, adjusting work schedules, promoting physical activity, and educating employees on healthy nutrition and sleep practices.*
 - Research on NPCE methods indicates they may be more effective at enhancing cognition than pharmaceutical approaches, and are free of side effects.⁹ Support your staff with targeted, holistic wellness programs as part of a larger corporate strategy that extends beyond IT (see "Employee Wellness: What You Need to Know Before Planning").

Acronym Key and Glossary Terms

ADHD	attention-deficit hyperactivity disorder
CED	cognitive enhancement drug
Nootropic	A drug used to enhance memory or other cognitive functions.
NPCE	non-pharmaceutical cognitive enhancement

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Maverick* Research: Living and Leading in the Brain-Aware Enterprise"

"Maverick* Research: The Future of Humans: Get Ready for Your Digitally, Chemically and Mechanically Enhanced Workforce"

"Maverick* Research: We Analyze Too Much, and Synthesize Too Little"

"Employee Wellness: What You Need to Know Before Planning"

"The CIO's Guide to Digital Ethics: Leading Your Enterprise in a Digital Society"

Evidence

¹ A. Sauter, K Gerlinger. "The Pharmacologically Improved Human." TAB. 2013.

² ["Poll results: look who's doping"](#)

³ A.G. Franke, C. Bagusat, P. Dietz and others ["Use of Illicit and Prescription Drugs for Cognitive or Mood Enhancement Among Surgeons."](#) BMC Medicine. 2013, 11: 102. BioMed Central Abstract.

- ⁴ ["In Depth: Why Silicon Valley Techies Are 'Microdosing LSD'."](#) Kron 4.
- ⁵ ["LSD Microdoses Make People Feel Sharper, and Scientists Want To Know How"](#) The Verge.
- ⁶ N. Bavarian, B.R. Flay and E. Smit. "An Exploratory Multilevel Analysis of Nonprescription Stimulant Use in a Sample of College Students." *Journal of Drug Issues*, 44(2), 132-149.2014.
- ⁷ Andreas G. Franke and others ["Methylphenidate, Modafinil, and Caffeine for Cognitive Enhancement in Chess: A Double-Blind, Randomized Controlled Trial,"](#) *European Neuropsychopharmacology*, Volume 27, Issue 3, 248-260. March 2017. Abstract.
- ⁸ Lanni and others. ["Cognition Enhancers Between Treating and Doping the Mind."](#) *Pharmacological Research* 57. 2008. Abstract.
- ⁹ L. Caviola, N. Faber. ["Pills or Push-Ups? Effectiveness and Public Perception of Pharmacological and Non-Pharmacological Cognitive Enhancement."](#) *Frontiers in Psychology*. 2015.
- ¹⁰ P.J. Nicholson, G. Mayho and C. Sharp. "Cognitive Enhancing Drugs and the Workplace." BMA. London. 2015.
- ¹¹ Reddit's popular [Nootropics](#) subreddit created a second subreddit, [/r/StackAdvice](#), due to the volume of users requesting advice on their CED stacks.
- ¹² A.D. Mohamed. ["Neuroethical Issues in Pharmacological Cognitive Enhancement."](#) *WIREs Cognitive Science*, Wiley Online Library.
- ¹³ S. Kotler, J. Wheal. "Stealing Fire: How Silicon Valley, the Navy SEALs, and Maverick Scientists Are Revolutionizing the Way We Live and Work." Dey Street Books. 2017.
- ¹⁴ N. Bostrom, R. Roache. ["Ethical Issues in Human Enhancement."](#) Nick Bostrom.
- ¹⁵ M. Farah, M. Smith, I. Ilieva, R. Hamilton. ["Cognitive Enhancement."](#) *WIREs Cognitive Science*, Wiley Online Library.
- ¹⁶ ["Use of Methylphenidate."](#) Annual Report 2014 (PDF). International Narcotics Control Board.
- ¹⁷ K. Finke, C.M. Dodds, P. Bublak, R. Regenthal, F. Baumann, T. Manly, U. Müller. ["Effects of Modafinil and Methylphenidate on Visual Attention Capacity: A TVA-Based Study."](#) *Psychopharmacology (Berl)*. 2010. Abstract. .

Note 1 Roots of the Word "Maverick"

Derived from the name of Texas rancher Samuel Maverick and his steadfast refusal to brand his cattle, "maverick" connotes someone who willfully takes an independent — and frequently disruptive or unorthodox — stand against prevailing modes of thought and action.

Note 2 Low Performance Versus High Performance

The phrases "low performing" and "lower baseline performance" are not intended to be negative or to introduce a stigma. In the context of the research studies, baseline performance in areas such as visual short-term memory or perceptual processing is first measured and populations are split into higher- and lower-performing groups.

Repeated studies indicate that commonly used CEDs provide greater benefit to those with lower baseline performance and may negatively impact performance for those with higher baseline performance.^{1, 11, 13, 16}

Note 3 Which Drugs Are Used for Cognitive Enhancement?

The most popular CEDs originated several decades ago, starting in 1955. Methylphenidate, commonly known as Ritalin, was developed to treat attention deficit hyperactivity disorder (ADHD). Methylphenidate has become a popular CED choice because of its easy availability. Between 2012 and 2013, global methylphenidate consumption surged 66%, with increased consumption by adults cited as a core factor.¹⁴

Modafinil, developed in the late 1970s, was created as a wakefulness agent. It has recently gained popularity as a cognitive enhancer. In one study, modafinil was more effective (15%) at improving cognitive performance than methylphenidate (13%).¹ (Caffeine, used by people everywhere as a casual cognitive enhancer, improved performance by 9%.¹)

Beta blockers, long used to block or suppress the effects of adrenaline, are also used as a cognitive enhancer of sorts to reduce anxiety and improve focus. Beta blockers have proven so effective at improving performance that the World Anti-Doping Agency (WADA) has banned them in sports requiring fine motor control, such as archery, golf and shooting. Beta blockers have also been used by musicians to reduce tremors and improve stage performance.⁷

None of these drugs was created to enhance cognitive capabilities in healthy people. It was only after decades of use for treatment that their enhancement possibilities became apparent. The long-term effects of these drugs on healthy individuals are unknown, but their alleged effectiveness has opened them up for use and misuse.

Table 1. Commonly Used Cognitive Enhancement Drugs

Name	Clinical Use	Side Effects	Cognitive Enhancement Effect
Aniracetam	May be used to treat dementia and other cognitive disorders.	Headaches, nausea and nervousness.	Mood enhancing and anxiety reducing effects attributed to this. May also improve verbal comprehension and memory retention.
Beta blockers	Used to treat high blood pressure, uneven heartbeat and tremors.	Chest pain, dizziness or fainting, changing heartbeat, trouble breathing, among others .	Reduces anxiety.
Caffeine	Some medicines and foods contain synthetic caffeine.	Increased blood pressure, anxiety, headaches, restlessness.	May improve concentration and idea production.
Chromium	Dietary supplement.	No side effects for naturally occurring, but supplementing with excessive amounts may cause stomach pain and low blood sugar.	Believe to promote concentration by stabilizing blood sugar levels.
Cocaine	Sometimes used topically as a numbing agent for surgical procedures.	Addiction, hallucinations, increased blood pressure, heart attacks, among others .	Increases alertness and arousal.
Creatine	Dietary supplement.	Muscle cramping, nausea.	Believed to increase overall energy levels by facilitating adenosine triphosphate (ATP) production.
Dextroamphetamine	Used to treat attention-deficit hyperactivity disorder (ADHD) and narcolepsy.	Itching, hives, swelling, blurred vision, irregular heartbeat, among others .	May improve concentration, focus and mental stamina.
DMAE	Used to treat ADHD, autism and Alzheimer's.	Headache, drowsiness, confusion, depression and unwanted movements of the face and mouth.	Overall improvements in mood and executive functions attributed to this.
Donepezil	Treatment for Alzheimer's disease and dementia.	Nausea, weight loss, severe stomach pain and seizures, among others .	May improve memory function and overall awareness.
Galantamine	Treatment for dementia.	Rashes, chest pain, irregular heartbeat and dizziness, among others .	May improve memory function and overall awareness.
Methylphenidate	A stimulant used to treat ADHD and narcolepsy.	Vision changes, hallucinations, seizures, chest	Moderately improved spatial working memory. No detected impact on

Name	Clinical Use	Side Effects	Cognitive Enhancement Effect
		pain and nausea, among others .	attention and executive function.
Modafinil	A stimulant used to treat narcolepsy, sleep apnea and shift-work sleep disorder.	Hallucinations, severe nausea, trouble breathing, agitation or aggressiveness, chest pain and anxiety, among others .	Moderately improved executive function. Significant improvement to executive functions in sleep-deprived state.
Niacin	Treatment for high cholesterol, slows the narrowing of the arteries.	Nausea, vomiting, itching or hives, among others .	May reduce stress and stabilize mood.
Phenylpiracetam	General stimulant designed to reduce stress, impulsiveness and irritability.	Headaches, indigestion, restlessness, nervousness and insomnia.	Improved learning ability, working memory and focus.
Picamilon	Dietary supplement recently banned by the U.S. Food and Drug Administration.	Low blood pressure, skin rashes.	May have anti-anxiety effects.
Piracetam	Used to treat myoclonic seizures (involuntary muscle movement).	Anxiety, insomnia, headache, weight gain, depression and weakness.	May improve memory function and learning.
Pyritinol	Treatment for dementia.	Nausea, headaches, skin reactions.	May improve mental agility.
Vasopressin	Treats frequent urination, thirst and loss of water caused by diabetes insipidus.	Itching, hives, chest pain, nausea, fainting, confusion and muscle twitching, among others .	May improve memory encoding and recall.
Vinpocetine	Possibly effective as a treatment for Alzheimer's.	Stomach pain, nausea, sleep disturbances.	Believed to improve blood flow to the brain.

Source: Gartner (September 2017)

This list only scratches the surface. There are also dozens of largely unregulated nutritional supplements marketed and sold online as cognitive enhancers. Clinical testing of the efficacy of these supplements is rare at best, and they may do more harm than good to aspiring Preservationists, Enhancers, Survivalists and Pharmanauts. *Caveat emptor*.

Note 4 Cognitive Enhancement Versus Treatment

How treatment and enhancement are defined is central to the debate around CEDs. Treatment can be considered the correction or remediation of some deficiency.

Definitions of enhancement vary. One definition of enhancement is any psychological or biological change improving the chances of living a good life. Bioethicists consider enhancement to be any intervention beyond what is necessary to sustain good health.⁶ An information-centric definition of cognitive enhancement is "the amplification of extension of core capacities of the mind through improvement of augmentation of internal and external information processing systems."⁸

More on This Topic

This is part of an in-depth collection of research. See the collection:

- [Maverick* Insights Drive Creative Destruction of Business as Usual: A Gartner Trend Insight Report](#)

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