LSE Literary Festival discussion

Self-Help: myth or reality?

Dr Julian Baggini
Founding Editor of The Philosophers’ Magazine, books including The Ego Trick and The Virtues of the Table

Professor Barbara J Sahakian
Professor of Clinical Neuropsychology, University of Cambridge and author of Bad Moves

Professor Paul Dolan
Professor of Behavioural Science, Department of Social Policy, LSE

Professor Ilina Singh
Chair, KCL

Suggested hashtag for Twitter users: #LSElitfest
‘Smart drugs’: Brain actions and ethical issues

Professor Barbara J Sahakian FMedSci

President of the British Association for Psychopharmacology
President of the International Neuroethics Society
University of Cambridge Department of Psychiatry
MRC/Wellcome Trust Behavioural and Clinical Neuroscience Institute
Cambridge UK
We need cognitive enhancing drugs to treat the cognitive disability of people with mental health disorders and brain injury

Disorders such as attention deficit hyperactivity disorder (ADHD), schizophrenia and Alzheimer’s disease all have associated cognitive problems.

Cognitive enhancing drugs (Smart Drugs) are needed to treat cognitive disabilities and improve functional outcome, quality of life and wellbeing for people with neuropsychiatric disorders and brain injury.

<table>
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<tr>
<th>Estimated total annual costs including health service costs, lost earnings, lost productivity and human costs</th>
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<tr>
<td>Depression                                                                                               £20.2-23.8 billion</td>
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<tr>
<td>Anxiety                                                                                                  £8.9 billion</td>
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<tr>
<td>Schizophrenia                                                                                            £13.3 billion</td>
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<tr>
<td>Dementia                                                                                                 £17 billion</td>
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<td>Somatisation disorder                                                                                     £17.6 billion</td>
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Department of Health (2011) No health without mental health: The economic case for improving efficiency and quality in mental health
Some Possible Methods of Boosting Your Brain Power

- Pharmacological (Smart Drugs)
- Neuroprosthetics for cognition
- Education
- Neurocognitive activation/ cognitive training/ brain training
- Physical exercise

Beddington, Cooper, Field, Goswami, Huppert, Jenkins, Jones, Kirkwood, Sahakian & Thomas


Learning helps to generate new brain cells

New brain cells in control

‘new’ brain cells after spatial learning


Voluntary exercise leads to an increase in overall neurogenesis

In rats, after 2-3 weeks of access to an exercise wheel, the number of BrdU positive cells (a DNA precursor) has almost doubled after 28 days

Action of methylphenidate, modafinil, and atomoxetine

**Methylphenidate** (Ritalin) increases synaptic concentration of Dopamine and Noradrenaline by blocking their reuptake.

**Atomoxetine** (Strattera) is a relatively selective noradrenaline reuptake inhibitor (SNRI).

**Modafinil** (Provigil) action is unclear; Possibilities include: indirect mediation of ACh and/or Adrenergic alpha –1 receptor activity. Appears to effect hypothalamic orexin and histamine, and has a small effect on dopamine transporter activity. Recent evidence suggests NA (Minzenberg et al 2008), DA (Volkow et al 2009) and glutamatergic mechanisms (Scoriels, Jones, Sahakian 2012).

How can we objectively measure cognitive processes such as working memory?
CANTAB Spatial Working Memory (SWM)

Look for a blue token hidden in one of the boxes, without returning to a box where a token has previously been found.

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Neuroimaging at the Wolfson Brain Imaging Centre
Methylphenidate (Ritalin) improves working memory & increases 'efficiency' of dorsolateral prefrontal cortical network in healthy volunteers

Modafinil improves working memory in healthy volunteers and in patients with first episode psychosis.

Müller, Rowe, Rittman, Lewis, Robbins and Sahakian (2012) Neuropharmacology

Ritalin abuse scoring high on college illegal drug circuit
January 8, 2001
Web posted at: 2:55 PM EST (1955 GMT)

From Linda Ciampa
CNN Medical Correspondent

(CNN) -- There's a popular drug on the streets with nicknames such as "Vitamin R" and "R-Ball" that's making its way into the college scene. But it's not for kicks -- students use this drug to improve concentration and study longer.

The drug is Ritalin, a mild stimulant commonly prescribed for young children to treat attention deficit/hyperactivity disorder, or ADHD.

But on U.S college campuses, students are popping Ritalin without a doctor's prescription -- which is illegal -- before taking on all-night study sessions or to boost alertness during an important test.

"People find this drug enticing because they can get their academic work done quicker or do more in a shorter period of time," said Dr. Eric Heiligenstein, of the University of Wisconsin. "So for students who have put off work or are not very strong academically, we find some are using it to kind of counteract or remedy their problems."

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Methylphenidate

Increasing prescriptions for Ritalin

Farah 2005, TiCS
"The prescribing of methylphenidate has continued to increase in both the NHS and private sectors. This is likely to be attributable to its use in the management of childhood and adult ADHD and, due to its potential for diversion, and misuse, its use should also be monitored carefully."

"Prof Sahakian is regularly approached by students who say they feel under pressure to take the drugs for fear of falling behind their peers."

13 August 2013

It is no longer caffeine but pills to which a rising number of students turn when revising

"The rise in prescription for methylphenidate (Ritalin) in England. Increase of 56% in the past five years (Care Quality Commission)."

"Today's undergraduates could be tomorrow's addicted workers as the use of performance-enhancing 'smart drugs' rises, says Joe Shute"
Increasing lifestyle use of ‘smart drugs’ by healthy people

• 16% of students on some college campuses in the USA
  (Babcock & Byrn, 2000, J. Am College Health)

• Prescriptions rates in England of stimulants have been rising steadily from 220,000 in 1998 to 418,300 in 2004.
  (Postnote, Parliamentary Office of Science and Technology, May 2007; Researched by G. Niyadurupola)

• Varsity Newspaper survey of Cambridge University students (2009)

• In 2008, the global market share of modafinil was more than $700 million per year

• It is estimated that around 90% of modafinil use is ‘off-label’ by healthy individuals.
  Normann & Berger (2008), Neuroenhancement: status quo and perspectives. Eur Arch Psych Clinic Neuro, 258 [Suppl 5], 110-114
  Vastag (2004), Poised to challenge need for sleep, “wakefulness enhancer” rouses concerns. JAMA, 291(2), 167-169
  Maher (2008), Poll results: look who’s doping, Nature, 452 (7188), 674-675
Why are healthy people using cognitive enhancing drugs?

- Increased performance / ‘competitive edge’ (effect sizes are generally small to moderate)
  Small percentage increments in performance can lead to significant improvements in functional outcome; it is conceivable that a 10% improvement in memory score could lead to an improvement in an A-level grade or degree class (Academy of Medical Sciences Report on Brain Science, Addiction and Drugs, 2008)

- To reduce the effects of jetlag and to stay awake for longer periods of time

- Increased motivation and enjoyment of tasks
  People report that they find it easier to carry out tasks that they had been putting off

- Significant increase in pleasure rating for the modafinil group on all tasks (p<0.001)

Muller, Rowe, Rittman, Lewis, Robbins & Sahakian (2012) Neuropharmacology
Modafinil reduces impulsivity and improves cognitive flexibility in sleep deprived doctors

What are the potential harms and concerns in regard to pharmacological cognitive enhancement?

- There could be long-term side-effects, especially in the developing brain. Long-term studies in healthy people are required
- People could be coerced, or even forced, into taking cognitive enhancers (24/7 society)
- There could be greater inequality, with access dependent on wealth
- Cheating, unfair advantage over others
- Abuse potential for certain PCEs (e.g., methylphenidate)
- Dangers of buying prescription drugs over the internet
- You could be “over-enhanced” e.g. plagued by unwanted memories

- We run the risk of becoming a homogeneous society
- Our perception of ourselves could change (mechanistic beings) and we will be unable to take credit for our achievements
- Virtues such as motivation and working hard could become outdated (students will just take a drug)
Neuroscience, Ethics and Society

Human enhancement and the future of work:

Academy of Medical Sciences, British Academy, Royal Academy of Engineering and Royal Society (November 2012).


University of Cambridge Science Festival 2014

Overcoming stress and anxiety: healthy brains for a flourishing society
11 March 2014
http://www.cam.ac.uk/science-festival
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