Neuro enhancement between hope and hype

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Outline

- What is neuro enhancement?
- The complex debate on neuroenhancement
  - Hype, hope and different frames
- Current state of cognitive enhancement
- Ethics of cognitive enhancement
Neuroenhancement

- Enhancement: “interventions that go beyond what is necessary to restore or sustain good health” (Juengst 1998)

- Improvement in mental functions of healthy individuals

- Mental functions: concentration, memory, mood, personality, behavior, sleep etc.

- Means: pharmaceutical, other?
Neuro enhancement?

- alcohol, nicotine, caffeine, cocaine, cannabis, Prozac...
Neuro/cognitive enhancement

- Prozac, Donepezil, Ritalin, Modafinil...
- New drugs being developed
Potential market for cognitive enhancement

- Nature poll (2008): 69% of scientists would take cognitive enhancing drug if safe
- Bergstrom & Lynoe (2008): 18.5% general public: pharmaceutical enhancement of intelligence acceptable
- Poll readers Gehirn und Geist: 60% would take cognitive enhancing drug if safe
Hype, hope and fear?

- Emerging enhancement-technology and the ‘sociology of expectations’

- Hype creates polarized debates: pro and con

- ‘cognitive enhancement’ versus ‘abuse of prescription drugs’
Two important questions:

I. What are the facts about current ‘cognitive enhancement’: what drugs are there, what are their effects and who are the users?

II. What are the ethical issues that we will need to address if cognitive enhancers are developed in the future?
Review

Botox for the brain: enhancement of cognition, mood and pro-social behavior and blunting of unwanted memories

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Current cognitive enhancers

- Donepezil:
  - Retention of helicopter flight training after 30 days

Donepezil and flight simulator performance: Effects on retention of complex skills

Abstract—We report a randomized, double-blind, parallel group, placebo-controlled study to test the effects of the acetylcholinesterase inhibitor, donepezil (5 mg/d for 30 days), on aircraft pilot performance in 18 licensed pilots with mean age of 52 years. After 30 days of treatment, the donepezil group showed greater ability to retain the capacity to perform a set of complex simulator tasks than the placebo group, p < 0.05. Donepezil appears to have beneficial effects on retention of training on complex aviation tasks in nondemented older adults.

J.A. Yesavage, MD; M.S. Mumenthaler, PhD; J.L. Taylor, PhD; L. Friedman, PhD; R. O’Hara, PhD; J. Sheikh, MD; J. Tinklenberg, MD; and P.J. Whitehouse, MD, PhD
Current cognitive enhancers

Modafinil (Provigil, Vigil)

- Improve attention
- Maintain wakefullness, memory, executive functions in sleep deprived
- Longer period sleep deprivation: deterioration function + overconfidence


Cognitive enhancing effects of modafinil in healthy volunteers

Does Modafinil Enhance Cognitive Performance in Young Volunteers Who Are Not Sleep-Deprived?

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The cognitive-enhancing properties of modafinil are limited in non-sleep-deprived middle-aged volunteers

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Effect of Modafinil similar to high dose of caffeine (600 mg).

During 36 hrs sleep-deprivation:
Normal alertness
Normal performance

Current cognitive enhancers
Current cognitive enhancers

- Methylphenidate (Ritalin)
  - Effect on spatial working memory
  - Enhances performance in novel tasks
  - Impairs previously established performance
  - No effect in healthy elderly

Meta analysis (Repantis e.a. 2010):
Positive effect on memory
No or negative effect on attention
Emerging cognitive enhancers

- Alzheimer research:
  - Ampakines (AMPA and NMDA-receptor)
  - CREB-increasing drugs
  - Promising future targets?
Cognitive enhancers: caveats

- Work better or only in sub-optimal performance
- Overdose may decrease functioning
- May enhance one function but impair another
- Trade offs (e.g. stability vs flexibility of long term memory)

- How optimistic can we be regarding scientific progress in this field??
Sum up: effects of current ‘cognitive enhancers’

- Effects on: memory (working-, episodic-), various executive functions, concentration, attention-span, need for sleep

- Effectiveness: often limited to certain tests and mild effects

- Limitations of research:
  - Lab situations, no ‘real life’ test
  - Small trials, single dose or short term; no longitudinal studies
  - “Expectations regarding the effectiveness of these drugs exceed their actual effects” (Repantis et al 2010)
Cognitive enhancers: risks and side-effects

- Risks, side-effects:
  - Often unknown, especially long term
  - Developing brains
  - Dependence?

- Risk-benefit ratio: risks less acceptable for enhancement than for treatment?
Current non-medical use of stimulants

- Nature poll (non-representative): 20%

- USA college students, past year: 4.1% - 35%

- Single-site, N=150: 35%

- Nationwide, N=10,000: 4.1%

- 6.9% lifetime

- National Survey Drugs and Health: 1.3%
Current non-medical use of stimulants

- The Netherlands:
  - 1.2% of highschool children (12-18 years)
  - 7% of university economy students (N=130)

- Belgium: 3% - 20% of students
Current non-medical use of stimulants

- Purpose of use unclear: cognitive enhancement (20-80%) or recreational use (30-70%)
- Non-medical use associated with higher rates of other substance abuse
- Possible association with non-diagnosed ADHD
Interim conclusion:

I. The claim that ritalin and modafinil are widely used and effective cognitive enhancers is unsubstantiated, misleading and potentially dangerous.

II. BUT: suppose that we will in the future develop safe and effective enhancers → what are the ethical issues?
Ethical and social implications

- Possible individual and social benefits
- Safety
- Freedom to use
- Fairness
- Justice
- Societal effects
- Role of doctor?
Freedom or coercion

- Coercion by employers?

- “Doctors may prescribe medication if it is necessary for certain types of work” (Glannon 2007)

- Moral responsibility?
Free choice?

INFORMED CONSENT
FOR
OPERATIONAL USE OF DEXEDRINE

It has been explained to me and I understand that the US Food and Drug Administration has not approved the use of Dexedrine to manage fatigue. However, I understand that Dexedrine previously has been approved for the treatment of sleeping disorders, obesity, and attention deficit disorder. Subsequently, it has also been found effective in treating the symptoms of chronic fatigue. I understand that it is for the benefit of controlling the symptoms of chronic fatigue that I have been provided a single dosage of the medication. I further understand that the decision to take this medication is mine alone.

In addition, I understand that possible common side effects of Dexedrine include Insomnia, nervousness, and appetite loss. Possible gastrointestinal disturbances include diarrhea, constipation, and/or dryness of the mouth. Other known, less common side effects include rapid heartbeat, heart palpitations, elevation of blood pressure, tremor, headache, euphoria, depression. Addiction and tolerance are also risked through prolonged use at increased dosages.

I have also been informed and understand that use of Dexedrine simultaneous with the use of certain other prescription or over-the-counter medications is not advised. * I have informed the flight surgeon of any other medications I am taking at this time.

My decision to take Dexedrine is voluntary. I understand that I am not being required to take the medication. Neither can I be punished if I decide not to take Dexedrine. However, should I choose not to take the medication under circumstances where its use appears indicated, I understand safety considerations may compel my commander, upon advise of the flight surgeon, to determine whether or not I should be considered unfit to fly a given mission.

I understand that a copy of this notice shall be inserted in my medical record. If I have any questions with regards to the administration of Dexedrine, I will raise them with the flight surgeon.

Member’s Signature and SSN ___________________________ Date ____________

* Use of the following other drugs and compounds simultaneous with Dexedrine is not advised: herbal compounds, glutamic acid, ascorbic acid (fruit juices, Vit C), antioxidants composed alkalinizing agents (sodium bicarbonate, other gastrointestinal and urinary alkalinizing agents), antihistamines, Thorazine (chlorpromazine, a tranquilizer/sedative), Zantac (ranitidine, an anti-ulcerant), haloperidol (anti-psychotic), anti-hypertensives, Demerol (meperidine), Norpace (verapamil), (for extreme hypertension), Phentoin (Dilantin, ant
Social pressure?

- According to respondents, use is “result of tremendous social pressure to perform and succeed in very competitive environments in a social context marked by pressures and the search for quick fixes”

- Social pressure: problem for autonomy

- Especially problematic when drugs are not safe and effective
Cheating?

- Would cognitive enhancers provide unfair advantage?
- Like doping in sports?
- Either unfair or self-defeating
- Cognition only partly a positional good, also non-positional good
Easy short cut?

- Corrosive effects on character?
- Not deserving of praise?
- But: results often more important than the means
Justice and equality

- Equal access for everyone?
- OR: social divide between have’s and have-not’s?
- Increase or decrease equality?
- Luxury or necessity?
Effects on society

- Effective cognitive enhancers may provide individual and/or collective benefits (economic & scientific progress)

- Or will individual competitive benefits lead to cognitive arms-race and 24/7 society?

- Less attention for alternatives (e.g. good work-rest balance)?
Role of the doctor?

- On/off label prescription?
- E.g. modafinil for jetlag
- Guided by same principles as treatment?
Regulation

Various options:

- Prohibition
- Prescription by doctors (on label or off-label)
- Special ‘cosmetic psychopharmacology’ clinics
- Free market (over-the-counter)

- Which option is best suited to accommodate ethical concerns?
Conclusions

- There is a hype about cognitive enhancement
- Current drugs are not proven to be effective enhancers
- Students and academics use these drugs → cause for concern
- Overly optimistic reports by scientists and bioethicists are potentially dangerous
- For the future: timely discussion of emerging ethical issues required to ensure ethical policy-making
Thank you for your attention!