Neuroethics

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BioS 010 : Bioscience in the 21st Century
Mind, brain, and biomedical science

The “neuro-turn”: prioritizing brain-based explanations of mind and behavior

http://www.brainfacts.org/3D-Brain

Source: BRAIN 2025, A Scientific Approach
Neuroethics (recap)

How “ought” we to consider, research, and treat brains in health and illness?

How should we study ___ ??

Whose ___ should we study??

Who should do the studying of ___ ??

How should we use the knowledge that we gain from brain research?
History, Ethics and Neuroscience

In February of 1990 at the age of 26, Terri Schiavo collapsed at home and oxygen was cut off from her brain for several minutes. As a result, she fell into a coma. In May of 1990, she emerged from her coma but remained unconscious in a **permanent vegetative state**. Although severely brain-damaged, Terri Schiavo was able to breathe, and maintain a heartbeat and blood pressure on her own. While her vision was impaired, her eyes were open and functional and she could move her limbs. She needed a feeding tube connected to her stomach to sustain her life. For many years, Terri’s husband, Michael, and Terri’s parents worked with doctors to try to help Terri regain consciousness. However, years of rehabilitation failed, and Terri did not improve. Arguing that it would have been Terri’s wish to die, Michael, who was Terri’s legal guardian, sought to discontinue life support. Terri Schiavo’s family challenged this decision. On March 18, 2005, following a prolonged legal battle and media attention, her feeding tube was removed. Terri Schiavo died on March 31, 2005.

Text / case downloaded from: https://med.nyu.edu/ highschoolbioethics/module/schiavo
The Case of the Substance-Dependent Brain
Drug Use, Drug Abuse/Misuse, Drug Addiction?

What is the difference?

Addiction

- Dependence
- Sacrificing well-being or needs

Drug Use:
- Using a drug as intended

Drug Abuse/Misuse:
- Excess
  - No Dr's prescription
  - Consent/medical reason
  - Harm?

Addiction: Could be defined as a persistent seeking of a drug and habitual, compulsive use despite significant negative consequences.
Models of Addiction in Ethics

**Moral Model**
- Addiction as a choice and a “moral failing”
- Emphasizes individual willpower, “virtue” and responsibility
- Clinical models have moved away from moral framings.

**Medical (“Brain Disease”) Model**
- Addiction as a “disease” located in the brain
- Widely applied in neuroscience.
- The idea: If researchers can identify the brain mechanisms associated with addiction, they can develop biomedical treatments for addiction
- Raises questions like: if addiction changes the brain in predictable ways, are people responsible for behaviors they engage in as a result of that addiction?

**Social-Contextual Model**
- Addiction arises in certain social conditions; addiction is also *defined* in social context.
- If social conditions (like poverty, exposure to violence, abuse, etc.) push people toward addiction, is the responsibility for addiction shared as a society?
- Raises questions like: How do we, as a society, define addiction? What is an acceptable addiction? Who is responsible for the causes and consequences of addiction?
Purdue Pharma, Oxycontin, and Opioid Addiction

Kolodny et al. (2015)
Annu. Rev. Public Health 36:559–74

https://www.newyorker.com/magazine/2017/10/30/the-family-that-built-an-empire-of-pain

Nearly every US state is now suing OxyContin maker Purdue Pharma

Published Tue, Jun 4 2018 1:06 PM EDT | Updated Thu, Jun 6 2018 1:47 PM EDT


The maker of OxyContin will reportedly pay billions to settle opioid epidemic lawsuits

By German Lopez | @germanlopez | germanlopez@vox.com | Updated Sep 13, 2019, 7:58pm CDT


Purdue Pharma, maker of OxyContin, files for bankruptcy

The move is the first step of an agreement to settle thousands of lawsuits related to the opioid epidemic.

By German Lopez | @germanlopez | germanlopez@vox.com | Sep 16, 2019, 11:30am CDT

What ethical questions arise? What else would you want to know?
Addictive Processes and Reward: Key Brain Regions

The mesocorticolimbic dopamine pathway: Ventral Tegmental Area

http://www.brainfacts.org/3D-Brain

https://thebrain.mcgill.ca
Tolerance, Withdrawal, and Stress

Psychoactive drugs fit into membrane proteins (receptors, transporters) like keys in locks. They act like neurotransmitters OR can increase activity in neurotransmitter systems... like DOPAMINE, GABA, GLUTAMATE or ACETYLCHOLINE.

After a while neurons might get used to this added activity... and reduce receptors or neurotransmitter release, to keep a balance. This is how TOLERANCE can happen.

The problem is, with fewer receptors, people need to take more drug to feel good. And when people quit SOME drugs suddenly, their own neurotransmitter systems aren't working at full speed. This is when people experience WITHDRAWAL. It takes time for the brain's ENDogenous neurotransmitter systems to come back online.

The MEMORY of that reward, the STRESS of tolerance and withdrawal and ongoing life stresses can be challenging when people want to stop using.
After learning more about addiction neuroethics, what do you think? Who is responsible for negative consequences arising from addiction? What about the case against Purdue Pharma (and the Sackler family)?

1. Beneficence and Non-maleficence
   - Are drugs ever helpful?
   - Adequate steps to minimize risks?
   - Accuracy of claims / evidence

2. Autonomy
   - Informed Consent

3. Justice – (fairness)

4. Personhood and identity

5. Social and Individual responsibilities?
   - Deontological ethics – (duty-based)
   - Utilitarian ethics - (greatest good for the greatest number of people)
The Case of the Augmented Mind
Cognitive enhancement: a familiar issue?

"Enhancement"

Loosely defined as beyond healthy functioning
A primer on cognitive enhancement

Some common drugs that are used as cognitive enhancers:

- Dextroamphetamine (®Adderall)
- Methylphenidate (®Ritalin)
- Modafinil (®Provigil):

Synaptic transmission and reuptake

1. Calcium (Ca2+) enters the axon terminal.
2. Neurotransmitters are released from vesicles.
3. Receptors are activated on the postsynaptic neuron.

Finished, right?

4. Not yet! Neurotransmitter is degraded in the synapse OR
5. Taken back up into the cell by transporters (reuptake)

These steps keep too much neurotransmitter from building up in synapses.

Synaptic transmission and reuptake

- Methylphenidate, Dextroamphetamine and methamphetamine all block reuptake of the neurotransmitter dopamine.

- Modafinil probably does this too but its precise mechanism is unknown.
  - Can increase excitation through glutamate
  - Can decrease inhibition through GABA
Cognitive enhancers: key brain regions

Keep in mind: the entire brain – and multiple neurotransmitter systems - probably undergo changes. We don’t know what all of them will be!
After learning more about them, do you think cognitive enhancers should be allowed? Why? When? And for whom?

1. **Beneficence and Non-maleficence**
   - Are the drugs actually helpful?
   - Adequate steps to minimize risks?
   - Accuracy of claims / evidence

2. **Autonomy**
   - Informed Consent

3. **Distributive Justice** – *(fairness)*

4. **Personhood and identity**

5. **Social and Individual responsibilities?**
   - Deontological ethics – *(duty-based)*
   - Utilitarian ethics - *(greatest good for the greatest number of people)*

**Your questions, concerns & recommendations:**

- When a person has normal activity → treatment enhancement
- Necessity for function

One major problem to consider is the “treatment-enhancement distinction”...

Others? (addictive potential, long-term effects, etc.)
Who should decide...?

See this essay by an undergraduate contributor on the topic of cognitive enhancement: