Ethics in Neuroscience

Ann Fink, Ph.D.

Fri 9/21/2018

BioS 10/ BioS 90: Bioscience in the 21st Century
The “neuro-turn”: prioritizing brain-based explanations of mind and behavior

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.

Left: CT scan of normal brain; Right: Schiavo's 2002 CT scan provided by Ronald Cranford, showing loss of brain tissue. The black area is liquid, indicating hydrocephalus ex vacuo.[30]
The Case of the Transplanted Body and/or Head
A human head transplant would be reckless and ghastly. It’s time to talk about it.

Two surgeons based in China say such surgery is “imminent.”

Head Transplants: Sergio Canavero Is About to Perform the First Human Surgery—and There’s Nothing to Stop Him

BY HANNAH OSBORNE ON 11/13/17 AT 11:41 AM

Italian doctor says world's first human head transplant 'imminent'

The possibility of body / head transplantation: a media circus?
Exploring the issue through a critical neuroethics lens
First, what would you need to do to perform a body / head transplant? (sci / tech)

Your ideas:
- How to supply O2 to the brain
- How to reconnect nerve endings
- Time limit? to have a dismembered head?
- Keeping a body alive?
- Aftertherapy for a transplant?
- Who decides (consent) whether to donate?
- Personhood/personality. The donor?
- Senses, nervous system, degree of functionality
- Esophagus and trachea. Cost

What is being proposed by these physicians (technical / medical considerations):

1. Head is removed from one person
2. A body, minus head, is donated from a person (presumably healthy, having suffered brain death).
3. The head has to be kept alive
   - Cooled / oxygenated
4. All parts of the donor head have to be attached to the donor body in a spinal fusion.
   1. Nervous system
   2. Blood vessels
   3. Bones and connective tissue
The human nervous system:

The autonomic nervous system contains the sympathetic and parasympathetic nervous system.


http://www.brainfacts.org/3D-Brain#focus=Brain-cranial_nerves&zoom=false
The human head:

Vertebral column:

Blood vessels: arteries (shown here) supply the head with blood. Veins (not shown) bring blood back down to the heart.

Fun fact: the brain needs oxygen to stay alive; damage begins after ~5-6 minutes.
What could go wrong?

Your ethical concerns
- Consent: who decides to be a donor?
- Is this the same person as before?
  - Just thinking about the head?
  - Is the body a person?
- Are the donors dead?
  - Are doctors killing someone?
- Transplanting a head with degenerative disease onto a healthy body
  - Eligibility criteria for procedure

Some important concepts

1. **Scientific and medical ethics:**
   - Accuracy of claims / evidence
   - Openness to critique / peer review
   - Adequate steps to minimize risks
   - Safeguard health and well-being of patients.

2. **Autonomy**
   - Informed Consent

3. **Deontological ethics – (duty-based)**

4. **Utilitarian ethics - (greatest good for the greatest number of people)**

5. **Personhood and identity**

6. **Distributive Justice – (fairness)**
Critiques of this head / brain transplantation project

1. **Scientific and medical ethics:**
   - Insufficient evidence that the procedure could work.
   - Misleading and/or incomplete evidence overall
   - Inappropriate citation of literature: evidence cited refers to limited *spinal cord injury* studies in rodents, *not* head / body transplantation.
   - Inconsistent with current directions of treatment for spinal injury / paralysis (see image to the right)
   - Relies on “Unpublished Data”, not peer-reviewed studies.
   - Plan for performing procedures also not under peer review.
   - Unknown measures to address risks to patients or assess outcomes

2. **Autonomy**
   - Informed Consent – unclear how this would take place in most situations.

3. **Many potential moral dilemmas:**
   - **Personhood and identity:** “Who” would the person be. The head? The donated body? Can both consent? Does one or both people die?
   - **Distributive Justice** – Who stands to benefit from this procedure? What about the greater benefit from multiple organ transplants?

Alternatively:
The Case of the Augmented Mind
Cognitive enhancement: a more 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. **Scientific and medical ethics:**
   - Accuracy of claims / evidence
   - Openness to critique / peer review
   - Adequate steps to minimize risks
   - Safeguard health and well-being of patients.

2. **Autonomy**
   - Informed Consent

3. **Deontological ethics** – *(duty-based)*
4. **Utilitarian ethics** - *(greatest good for the greatest number of people)*
5. **Personhood and identity**
6. **Distributive Justice** – *(fairness)*

Your recommendations:
- Are they being used to help healthy people?
- Must you think you need a prescription? Why?
Who should decide...?

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